Pit and Quarry

With which is consolidated CEMENT-MILL & QUARRY

Member Audit Bureau of Circulations

Read in Largest Number of Plants

Published Biweekly on Wednesday for Producers and Manufacturers of Sand, Gravel, Stone, Cement, Gypsum, Lime, and Other Non-Metallic Minerals.

Subscription price: $5 for 3 years, $2 for 1 year in the United States and possessions, North, Central and South America; elsewhere $1 additional for each year. Single copies 20c.

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Michigan Gravel Firm Reports Huge Demand

80,000 TONS SHIPPED IN MAY

Capt. Peter Boet, superintendent of the Ferrysburg, Mich., plant of the Construction Materials Co. reports a record amount of 80,000 tons of gravel transported down the Grand River from the Bass River beds during May and that virtually all of this has been consigned, so great has been the number of orders to be filled. Three steamers, the huge carrier *Fontana*, the *Fred W. Green*, and the barge *Milwaukee*, a government vessel, have all been engaged in carrying gravel from the plant at Ferrysburg and a large number of men have been kept at work by the concern.

Three tugs and numbers of scows have been engaged in hauling the gravel from Bass River at the rate of about 3,500 tons daily and Capt. Boet leaves soon for Cleveland to return with another tug to be put in service which will further increase the capacity of the plant. Meanwhile, work is going ahead at increasing the efficiency and output of the plant until it is estimated that in the near future, a million tons of gravel a year will be hauled. There is enough gravel in the Bass River beds to last a century, Capt. Boet says. When the present work is completed, a constantly-moving string of tugs and scows will be needed to supply the demand for gravel at the washing, screening and loading plant at Ferrysburg.

Erects Plant to Batch Transit-Mixed Concrete

The Tucker Concrete Products Co., 2421 Cypress St., Fort Worth, Texas, is erecting a new batching plant for the production of transit-mixed concrete. All the equipment has been ordered and the plant is expected to be in operation about the middle of June.

The aggregate will be handled by a P & H gasoline crane with a ¾-cu.yd. Owen bucket into a Blaw-Knox 4-compartment steel bin. Bulk cement will be unloaded from cars by a power scraper and elevated to storage. A 4-way Blaw-Knox weighing batcher will measure the material. Concrete will be delivered in five 2½-cu. yd. Paris Transit Mixers mounted on White pneumatic-tired trucks. The plant will have a potential capacity of 250 cu. yd. of concrete per day which may be attained later by the addition of a few more trucks.

Huge Overburden Slide Halts Plant Operations

Due to a shortage of limestone caused by a big slide of overburden at the Beaver Portland Cement Company's Marble Mountain quarry at Gold Hill, Ore., the plant has closed down for about 30 days. It will take at least that long to get things in working order at the quarry, and in the meantime all the employees at the plant, with additional mechanics, will be kept at work making annual repairs on the plant, which usually are made later on in the season.

The company has a large reserve of cement in storage to supply shipping during the close-down. The company employs more than 100 men at the Gold Hill plant and Marble Mountain quarries.

To Open Quartz Plant in Old Georgia Gold Fields

The Copps Development Co. of Milwaukee, Wis., is about to open a new plant at Dahlonega, Ga., to treat ores of asbestos, soapstone, quartz and mica. It was in this district that the mining of gold in America had its beginning, in 1828, and the first government mint was erected there to coin gold. The gold is associated with the quartz veins, so that, in the new scope of activities, provision is to be made, during the treatments for the non-metallic minerals, to recover some gold.

Wisconsin Gravel Firm Reports Sales Increase

The Big Bend Sand & Gravel Co., Big Bend, Wis., reports a substantial increase in sales over the first five months of 1929. It furnishes sand and gravel used by the Milwaukee Electric Railway & Light Co. in track extensions.

Gypsum Association Holds First Meeting

CO-OPERATIVE EFFORTS URGED

The Gypsum Association, organized a few weeks ago to succeed the Gypsum Institute, held its first regular meeting June 10 and 11, at the Bismarck Hotel, Chicago.

The business transacted was merely along lines of effective co-operation between the thirteen member companies. Various committees and the delegates discussed pertinent matters that were deemed essential in getting the Association well under way. The following companies were represented by delegates:

American Gypsum Co., Fort Clinton, O.
Atlantic Gypsum Products Co., Boston, Mass.
Best Bros. Keene's Cement Co., Medicine Lodge, Kan.
Certain-teed Products Corp., New York, N. Y.
Ebsary Gypsum Co., Wheatland, N. Y.
Grand Rapids Plaster Co., Grand Rapids, Mich.
National Gypsum Co., Buffalo, N. Y.
Texas Cement Plaster, Oklahoma City, Okla.
United States Gypsum Co., Chicago, Ill.
Universal Gypsum & Lime Co., Chicago, Ill.

There was a full attendance of the officers and executive committee. James Leenhouts, general manager of the Grand Rapids Plaster Co., president, presided at the sessions. Henry J. Schweim, executive secretary and chief engineer, took a prominent part in all discussions, as did also C. F. Henning of the United States Gypsum Co., first vice-president; L. I. Neale of the Atlantic Gypsum Products Co., second vice-president; Eugene Holland, of the Universal Gypsum & Lime Co., treasurer; and W. J. Fitzgerald, manager of the traffic bureau.

The Association plans to hold four regular meetings per year. The next meeting will be held Sept. 9, 1930, at the Bismarck Hotel, Chicago. The offices are in the new Chicago Evening Post Building, 211 W. Wacker Drive, Chicago.

Illinois Operator Buys Plant of Colby Company

The Western Sand & Gravel Co. of Spring Valley, Ill., has acquired the plant and pit of the Colby Gravel Co., located at Moronts, near Granville, Ill.

Public Works Leading Construction Awards

MAY CONTRACTS ARE $457,416,000

May awards for new building and engineering projects in the 37 states east of the Rocky Mountains, totaled $457,416,000 according to the F. W. Dodge Corp. This was a decline of 5 per cent from the total of $482,876,700 for the preceding month. The past month's record was 22 per cent below the May, 1929, total of $587,765,900. For the first five months of the year construction contracts totaled $2,037,439,900. This was a decline of 18 per cent from the total of $2,485,655,700 for the corresponding period of 1929.

For the fifth consecutive month public works and utilities were the most important of all classes. This group totaled $134,913,100, or 29 per cent of all awards in May. Residential building amounted to $116,568,500 or 25 per cent of the total; contracts for commercial buildings amounted to $73,340,200 or 16 per cent; and industrial structures totaled $54,566,400 or 12 per cent. All other classes of nonresidential buildings were 18 per cent of the May total.

Contemplated new work of all kinds reported in May amounted to $643,405,900, compared with $954,618,300 for the previous month and $847,156,600 for May 1929.

The table at the bottom of this page was compiled from figures supplied by the F. W. Dodge Corp. for the states and building areas east of the Rocky Mountains.

Safety Trophy Awarded Michigan Stone Quarry

The Rogers City, Mich., quarry of the Michigan Limestone & Chemical Co., has been adjudged winner of the quarry and open-cut mine group of the National Safety Competition of 1929 and will be awarded the bronze plaque emblematic of the Sentinels of Safety trophy.

Each employee of the quarry and plant will be presented with a certificate of honor by the U. S. Bureau of Mines, under whose auspices the contest is conducted each year. Robert P. Lamont, secretary of commerce, recently sent the company a personal letter congratulating it upon its achievement.

Figures covering the competition are not available, but 248 mines and quarries in 35 states participated in the competition in 1928 and it is believed that last year's contest attracted at least that many participants.

Launch Sand-and-Gravel Plant Near Waco, Texas

The Texas Sand and Gravel Co., Waco, Tex., which operates a number of sand-and-gravel plants in central and western Texas, recently put into operation a small plant at Texand, four miles south of Waco. This plant, which is located adjacent to an old pit which has been operated for fifteen years, has a capacity of 15 cars of gravel and the same amount of sand per day.

This company early in the spring began operating another plant of similar capacity one-half mile east of the new Texand plant. Both plants were erected and are being operated under the supervision of T. J. Palm, general superintendent.

Channeling Machines Added at Furst Quarry

The Carl Furst Co. limestone quarry at Bedford, Ind., is operating full force and recently added four channeling machines and a large steel derrick to its equipment. During the past 60 days the company has booked orders for 250 carloads of stone.

Cement Plant Builds Four New Storage Silos

$75,000 EXTENSION BY AETNA CO.

Plans are underway for the erection of four new silos which will practically double the storage facilities of the Bay City, Mich., plant of the Aetna-Portland Cement Co., according to an announcement by Edward A. Harris, office manager. The approximate expenditure will be $75,000.

The general contract for the work has been awarded to the McDonald Engineering Co., Chicago. The contractors are now at work driving piles. The entire job is to be completed in between 60 and 90 days, Mr. Harris said.

The new silos are designed to hold a total of 90,000 bbl. of cement. Each is to be about 80 ft. in height. The total capacity of the four present silos is 50,000 bbl. Their height is 70 ft.

"With increased storage facilities," Mr. Harris said, "the plant will be able to operate on an increased schedule the year round. We are operating three steamers and, at the present time, are employing about 175 men, counting the boat crews."

Home of German Cement Association is Rebuilt

The *Zementhaus*—the home of the Deutscher Zement-Bund in Charlottenburg (Berlin) Germany, now appears in a new garb that makes this building one of the show places of concrete art in Germany, according to the journal *Zement*. The association's home has been largely rebuilt along modern design, utilizing concrete in all the useful and decorative forms available and is particularly interesting for the beautiful light-gray tiles on the facade and the ornamental concrete work in the inner court.

BUILDING AND ENGINEERING CONTRACTS AWARDED DURING MAY, 1930, BY TERRITORIES, EAST OF ROCKY MOUNTAINS

Territories	May, 1930, Building and Engineering Contracts Awarded	Per Cent Increase or Decrease, Compared with—		Contracts Awarded During Jan., Feb., Mar., Apr., and May, 1930, and Per Cent, Increase or Decrease Compared with Same Period 1929		Distribution of May, 1930, Contract Awards				
		April, 1930	May, 1929			Residential	Commercial and Industrial	Public Works and Utilities	Educational	Contemplated Building Reported
New England States	$36,513,900	− 13.2	− 14.0	$145,406,100	− 15.4	$12,305,800	$ 4,123,200	$ 5,555,800	$5,213,400	$ 50,620,600
Metropolitan New York and vincinity	96,208,600	− 4.0	− 3.8	432,177,900	− 15.0	32,022,500	28,923,200	16,978,400	7,914,800	172,434,100
Up-state New York	24,478,300	+ 23.0	+ 6.0	80,386,300	+ 13.9	4,493,500	1,656,700	14,156,600	2,380,800	27,051,500
Middle Atlantic states	37,393,500	− 37.4	− 35.0	245,278,200	− 21.5	10,247,500	5,019,900	9,011,800	.....	41,948,800
Pittsburgh territory	57,009,100	+ 4.0	− 19.8	267,336,600	− 8.8	14,718,700	13,702,000	20,320,500	.....	65,273,100
Southern Michigan	22,170,800	+ 4.8	− 55.1	75,015,800	− 47.2	5,813,000	5,779,100	7,805,200	.....	14,960,400
Chicago territory	59,468,200	− 7.6	− 44.0	254,923,100	− 34.4	15,649,700	15,199,400	19,453,600	.....	113,158,100
Central Northwest	11,015,000	+ 10.5	− 23.0	38.065,900	− 15.3	1,630,700	2,318,600	3,678,000	1,400,000	9,379,100
St. Louis territory	21,882,800	+ 16.0	− 19.0	79,549,100	− 26.8	4,318,800	2,766,700	9,975,500	2,100,700	24,853,900
Kansas City territory	18,898,700	− 21.0	− 22.2	122,034,100	+ 17.0	3,970,700	4,746,700	4,305,300	2,432,600	22,032,400
Texas	14,368.300	− 34.6	− 32.0	96,210,800	− 3.1	3,520,000	2,019,500	4,375,900	1,514,900	29,489,100
New Orleans territory	14,299,500	+125.1	+ 12.0	54,418,900	− 26.0	1,847,000	6,204,600	3,939,200	864,300	21,711,700
Southeastern territory	43,709,300	+ 31.0	+ 12.0	146,637,100	+ 4.0	6,030,700	18,677,600	15,357,300	.....	50,493,100

The Metropolitan New York territory includes northern New Jersey, Long Island, Westchester, Orange, Putnam and Rockland Counties. The upstate New York territory covers all counties north of Orange, Putnam and Rockland Counties. The Pittsburgh territory comprises western Pennsylvania, West Virginia, Ohio and Kentucky. By Southern Michigan is meant the so-called southern peninsula. Chicago territory embraces northern Illinois, Indiana, Iowa, eastern and southern Wisconsin. The Central Northwest territory covers Minnesota, North Dakota, South Dakota, northern peninsula of Michigan and northwestern Wisconsin. St. Louis territory comprises southern Illinois, eastern Missouri, northeastern Arkansas, western Tennessee and north western Mississippi. Kansas City territory includes western Missouri, Kansas, Oklahoma and Nebraska. New Orleans territory embraces Louisiana, western and southern Arkansas, eastern and southern Mississippi. The Southeastern territory includes North and South Carolina, Georgia, Florida, Alabama and eastern Tennessee.

Resolution Adopted Favoring Road Show

EXECUTIVE COMMITTEE ACTION

Declaring it would be inexpedient to forego the annual road show in connection with the 1931 meeting of the American Road Builders' Association, to be held in St. Louis in January, the Association's executive committee recently adopted a resolution urging that the show be held. There had been some sentiment toward discontinuing this popular feature in connection with the yearly gathering of the road builders. The text of the resolution was as follows:

Whereas, At the annual meeting of the manufacturers' division of the American Road Builders' Association, held in Atlantic City in January, 1930, the executive committee was instructed to investigate and report on the desirability of holding the road show of the American Road Builders' Association biennially instead of annually, and

Whereas, In accordance with the terms of that instruction, the president has called in to advise the executive committee a representative group of the membership, and

Whereas, This committee has conducted a most comprehensive study of the present situation and needs of the highway industry, taking counsel from a number of interested groups and associations, including the federal, state, county and municipal highway officials, road building contractors, the Associated General Contractors and representative manufacturers, and

Whereas, Several regional road shows have already been projected for 1931, contingent upon the failure of the American Road Builders' Association to hold a 1931 show,

Be It Hereby Resolved, That in view of all the foregoing and of the proposal of the American Road Builders' Association to hold its 1931 convention at St. Louis, thereby observing a policy of rotation, the executive committee is convinced that it would be highly undesirable to forego the 1931 road show, and

Be It Further Resolved, That we endorse, therefore, the proposal of the American Road Builders' Association to hold a road show in connection with its 1931 convention at St. Louis, Mo.

West Virginia to Spend $17,000,000 for Roads

The road-building program for West Virginia for this year will show some increase over previous schedules. All of this work will use $13,800,000 of the funds, leaving $3,280,000 for maintenance of the state highways.

The principal routes on the system will be completed at least as low-type surfacing by the end of the 1930 program. Reconstruction of sections of a number of these routes on an extensive scale is under way, and will require this year and 1931 to complete. These sections to be reconstructed are in large part in the now thickly settled communities.

Besides completing the principal routes with at least low-type surfacing by the end of the 1930 season, probably 90 per cent of the state system will be at least graded and drained.

The program for 1930 comprises 257 miles of concrete, 85 miles of gravel and macadam, 167 miles of grading, 40 bridges, and 10 major grade crossing eliminations.

Ready-Mix Concrete Men to Gather at Pittsburgh

The final organization meeting of the National Ready-Mixed Concrete Association, which was formed at a meeting held in Chicago on May 16, will be held July 10 at Pittsburgh, Pa. A committee composed of J. E. Burke, Alex. Foster, Jr., A. A. Levison, C. M. Cornell and A. C. Avril, appointed at the Chicago meeting, has canvassed the operators in the industry and will deliver a complete report at the Pittsburgh meeting.

New Deposit Opened by East Texas Gravel Co.

The East Texas Gravel Co., operating a 25-car-capacity plant 26 miles south of Dallas, opened a new deposit on May 1 of this year. This new deposit is connected with the plant by a 4½-mile side track. It consists of 310 acres estimated to contain about 7,000,000 cu. yd. of gravel. The same dragline used at the old pit near the plant is being used at the new pit.

Nashville Ready-Mixed Firm Erects New Plant

The Nashville Ready-Mixed Concrete & Supply Co. recently erected a concrete-mixing plant at Tenth and Fatherland Sts., Nashville, Tenn. Offices are in the Fourth and First National Bank Bldg., Nashville, and the officers are: A. D. Creighton, president; C. C. Robertson, vice-president; and W. E. Haswell, secretary-treasurer.

Prepare Products from Crushed White Dolomite

The Metro-Nite Co., 333 Hartford Ave., Milwaukee, Wis., is preparing commercial products from a beautiful, white dolomite. As a paint pigment or extender, it is pulverized to 400-mesh. For use as aggregate in cast-stone products it is crushed and furnished in ⅛-in., ¼-in. and ⅜-in. sizes. The company operates plants at Felch, Mich., and North Milwaukee, Wis.

No-Accident Race in Lehigh Valley Mills

CONTEST TO LAST FIVE MONTHS

On May 22, the Nazareth division of the Lehigh Valley Safety Council held the largest meeting in its history, approximately 1,000 people being present. The attendance represented a large majority of all the employees of all cement companies in and around Nazareth, together with members of the Bates Valve Bag Co. The following organizations sponsored the meeting and attended in large numbers: Hercules Cement Corp., Nazareth Cement Co., Lone Star Cement Co., Pennsylvania, Keystone Cement Co., Penn-Dixie Cement Corp., Bates Valve Bag Co., Nazareth public schools, Chamber of Commerce and Rotary Club. The purpose of the meeting was to draw all organizations that are members of the National Safety Council into a semi-annual meeting, and to start off a five-month no-accident campaign in which the Hercules Cement Corp., Nazareth Cement Co., Lone Star Cement Co., Keystone Cement Co. and Penn-Dixie Cement Corp., Plants No. 4 and No. 6 will compete for silver plaques which will be awarded at the conclusion of the campaign.

Fred Hunt, electrical engineer of the Nazareth Cement Co., acted as chairman of the meeting. He introduced R. B. Fortuin, assistant to general manager of the Penn-Dixie Cement Corp., who outlined the purpose of the meeting and the procedure in the campaign. Mr. Fortuin stated that, in 1927, the plants participating in the campaign suffered twenty lost-time accidents. The following year, which was the first campaign, resulted in but three lost-time accidents among all the competing plants. Three lost-time accidents were reported for the same period in 1929. The chairman then introduced W. P. Grady, foreman of the Canton, O., shops of the Pennsylvania Railroad. The keynote of his talk was that a man, to be an efficient employee and one who is a safe employee to himself and his fellow-workers, requires three assets —personality, poise and tact. Following Mr. Grady's talk the meeting was closed by showing a motion picture.

Limestone Products, Ltd. Formed at Uhthoff, Ont.

Limestone Products, Ltd., a new Canadian producing company, was recently formed at Uhthoff, Ont., where the quarry and plant are located. Offices are being maintained at Toronto and deliveries are made over the Canadian Pacific and Canadian National Railways. Crushed stone and fluxing stone are being produced. G. F. Morse is general manager.

Diatomite Producers Unite in Big Merger

PLAN INCREASED PRODUCTION

A merger in the production and marketing of diatomite has recently been effected, under the title of International Diatomite Industries, Ltd. Parties in the consolidation are: Oxford Tripoli Sales Co., with diatomite deposits in Colchester County, N. S., and a finishing plant at Haverstraw, N. Y.; Scotia Diatom Products, Ltd., with deposits and plant at Little River, Digby County, N. S.; Atlantic Gypsum Products Co., with deposits in Nova Scotia.

The merger has purchased diatomite deposits at Pollett Lake, Kings County, N. B., and will soon start work there. The newly-acquired deposits are reported very valuable. Increases in the output of the work at Little River and New Annam will be made this year. Ray Donaldson, of Haverstraw, N. Y., formerly president of the Oxford Tripoli Sales Co., has been named president of International Diatomite Industries, Ltd. M. F. Gregg, of Moncton, N. B., is vice-president. The remaining members of the board are: F. M. Ross, of Montreal and St. John, N. B.; J. G. Winant, of Concord, N. H., and W. P. Fuller, of Boston, the latter being president of the Atlantic Gypsum Products Co.

The company has announced its intention of increasing its former combined output about 50 per cent this year, with prospects that the increase next year will be even greater. Installation of new machinery at the Little River deposits has been completed. It is possible that other new deposits will be acquired in New Brunswick.

Kewaunee Gravel Co. to Open New Plant Shortly

The Kewaunee Gravel Co., Milwaukee, Wis., will soon open its new plant at Luxemburg, Wis. Machinery will be ordered from the Fred T. Kern Co., Milwaukee, as soon as financing has been completed, it is reported. The company will also develop a granite paving-block quarry later on.

Oklahoma Continues Its Road-Building Schedule

The road-building program for Oklahoma for this year will continue the substantial schedule that the highway commission has carried on for a number of years.

Over 1,000 miles of state roads have been surfaced with concrete, and some 1,638 miles surfaced with gravel and macadam. There are $12,000,000 available for construction this year, and with this 250 miles of concrete and 50 miles of gravel will be constructed and 420 miles of grading will be done.

It is proposed to maintain the highway system in a satisfactory manner and $3,000,000 has been set aside for this work.

New Feldspar Standards in Effect September 1

Under date of April 17, 1930, the U. S. Bureau of Standards sent out for written acceptance a recommended commercial standard classification for feldspar. Since that time 162 signed acceptances, representing practically all of the grinders, a number of the larger distributors, and many consumers of feldspar, have been received, indicating a satisfactory majority approval.

Accordingly, the commercial standard is to be considered effective for new production starting September 1, 1930.

To Install Hammermill and Vibrating Screens

The Arkansas Lime Products Co., Whitecliffs, Ark., is planning to install a Williams No. 3 hammermill and two 4-ft. by 8-ft. single-deck Link-Belt vibrating screens to produce 60-mesh limerock for use as a road stabilizer. The company contemplates the erection of a new 10,000-ton wooden storage bin which will unload through a concrete tunnel to a belt conveyor.

Purchased, Not Leased, Sand Deposit in Indiana

The Great Lakes Foundry Sand Co. of Detroit, Mich., which opened a sand pit at Lake Cicotte, Ind., recently, has purchased the deposit outright instead of leasing it, as was first reported some time ago. The deposit contains foundry, bank and asphalt sand.

Quebec Has Impressive Road-Building Program

Hon. J. E. Perreault, minister of roads, Quebec, has announced a $11,000,000 road-construction program for 1930. Important features are the completion of five important highways into the northern sections of the province, new approaches to several Montreal bridges, and the widening of the Montreal-Toronto highway.

McGrath Sand & Gravel Co. to Develop Deposits

The McGrath Sand & Gravel Co., Mackinaw, Ill., will develop gravel deposits on the Boyle farm west of Mackinaw, it is reported. Clyde Woodrum is superintendent.

New Ohio Stone Firm in Operation Shortly

T. J. SCHNEE HEADS CONCERN

The Glenridge Stone Co., a firm recently organized and made up of Akron, Cleveland and Millersburg, O., interests have opened a stone quarry on the Scott and Hipp properties near Glenmont, O. The new company will be shipping stone from the quarry within sixty days provided no unforeseen delay is encountered in preliminary work, according to T. J. Schnee, who heads the organization.

The company leased approximately eight and one-half acres of deposits several months ago. After prospecting and submitting samples of the stone found on the lease, the Glenridge Stone Co. was formed and applications for a railroad switch and power lines were made.

Workmen are now busy stripping the overburden preparatory to quarrying the stone. As soon as applications for power and switching rights have been granted, work will be started on the building of a sawing plant at the foot of the quarry hill.

In commenting on the prospects of business development Mr. Schnee said, "We have a good lease and prospects for a good business."

Two Shifts of Workmen at Union Pacific Plant

Two shifts of workmen have been employed at the Buford, Wyo., gravel plant maintained by the Union Pacific System. The pits and plant at that place provide most of the material for use as ballast and around stations on the railway's entire system. Thousands of tons of gravel are removed and shipped annually. Two steam shovels are used in excavating the material.

Obtains Contracts for 90,000 Tons of Gravel

The Prospect Sand & Gravel Co., Prospect, Wis., formerly operated under contract by the Lannon Sand & Stone Co., has obtained contracts to furnish 90,000 tons of sand and gravel for two large construction jobs in Milwaukee, Wis. Peter Vanderboom is superintendent, and Howard Vanderboom is sales manager.

Mine Rock for Fluxing Copper Ores in Arizona

The Hinman Pure Lime Co., recently incorporated, is now mining lime rock for fluxing copper-bearing ores for the United Verde Extension Mining Co. at Clemenceau, Ariz. Grant Hinman is manager of the concern's operations.

Texas Producers to Convene on July 29

CREDIT BUREAU IS AUTHORIZED

The annual meeting of the Texas Sand and Gravel Producers' Association will be held July 29 at the Austin Hotel, Austin, Tex. W. W. Carson, executive engineer, Littlefield Bldg., Austin, Tex., is in charge of arrangements. The meeting will precede a big letting of state highway contracts on July 30 and 31. V. P. Ahearn of the National Sand and Gravel Association will be a guest of honor.

At the monthly meeting of the Association held May 19 at Austin, the formation of a credit bureau was authorized. This bureau will be a part of the association and its purpose will be to distribute credit information to the members.

The monthly meeting to be held at Austin on June 23 will be devoted principally to the formation of trade practice standards. These standards will include sales methods, uniform sales prices, and the handling of accounts. They will be patterned somewhat after the standards outlined at the national convention held at Memphis last January. All accounts for the credit bureau will also be classified at this meeting.

Limestone Company Will Build New Power Plant

Stevens & Wood, Inc., architects of New York and Chicago, are preparing plans for new power plant to be constructed by the Michigan Limestone & Chemical Co., at Rogers City, Mich. The plant will cost over $65,000 with equipment, it is reported.

Diatom Products Co. to Remodel Asbestos Plants

The Diatom Products Co., Seattle, Wash., which some time ago purchased the plant of the Panhandle Asbestos Co. at Kamiah, Ida., and also leased an asbestos mine near Kamiah, will remodel the plant, install new equipment, and produce asbestos commercially.

World Power Conference Offices Moved to N. Y.

Headquarters of the American committee of the World Power Conference will be moved from Washington to New York on July 1. A year's experience with the offices of the committee in Washington has demonstrated that greater efficiency can be secured by having headquarters in New York, where the committee will be more accessible to those having dealings with it.

O. C. Merrill, chairman of the committee, reports that attendance at the Berlin conference will exceed 4,000, whereas only 1,700 delegates attended the 1924 conference at London. The American delegation will sail from New York on June 4.

Sulphur Rights Bought by American Cyanamid Co.

American Cyanamid Co., New York, N. Y., has secured sulphur rights at the Jefferson Island salt dome, held by the Jefferson Lake Oil Co., near New Orleans, and contemplates the construction of a plant for commercial production to cost over $1,300,000 with machinery.

Names Engineering Firm to Supervise Addition

The Clearwater Lime Co., of Orofino, Ida., has engaged the firm of Newell, Carter & Walsh, of Portland, Ore., to supervise the erection of additions to the present lime and limestone products plant which was described in the March 12, 1930 issue of PIT AND QUARRY.

Missouri Portland Will Construct Tulsa Plant

Executives of the Missouri Portland Cement Co. of St. Louis, have selected Tulsa, Okla., as the site of a new wet-process cement plant to have a daily capacity of 3,000 bbl. The plant will require a force of 250 men not including salesmen working out of Tulsa headquarters.

G. A. Saeger, C. E. and P. H. Blaise, general superintendent, who were recently guests of the Tulsa Chamber of Commerce stated that while the future site will be withheld for a time, core drilling is proceeding at several favorable locations.

Fire Causes Damage at Keokuk, Ia. Sand Plant

Fire recently destroyed a tool shed and its contents at the Keokuk, Ia., plant of the Miller Brothers Sand Co. The blaze was caused by sparks from a steam hoisting engine, it is believed.

Add Washing Equipment at Plant in Louisiana

The Louisiana Sand & Gravel Co. has completed the installation of a new washing unit at Sun, La., which about doubles the rated production capacity of the company. William Noble is superintendent of the Sun plant.

Omaha Producer Opening Plant on Platte River

The George W. Bell Co., Omaha, Neb., large producer of sand and gravel in eastern Nebraska, has announced the opening of a new plant on the Platte River, south of Omaha. Delivery of material to Omaha and Lincoln is being made by trucks.

To Mine Potash at New Mexico Deposit

SINKS SHAFT 1,100 FEET DEEP

A report just received from Hobbs, N. M., states that mining of potash will soon be under way in New Mexico, at a point 40 miles southwest of that city. The United States Potash Co., a subsidiary of Snowden & MacSwinney of New York, owns a large tract of land which test holes indicate is underlaid with potash, and is sinking a shaft to the deposit, 1,100 ft. below the surface. The location of this shaft is near the test holes which the U. S. Bureau of Mines drilled and in which potash in commercial quantities was found.

Initial production of the United States Potash Co. will be brought to the surface through the shaft now being sunk, but other shafts will be put down as the development progresses. More than $1,000,000 has been made available for preliminary mining operations, including purchase of equipment and machinery. Electric power will be used to operate the mining plant. No estimate has been made of the probable production of the company.

Opens Washing, Crushing Plant Near Alturas, Cal.

The Renshaw Sand, Rock and Gravel Co. recently began operations on a new crushing and washing plant at Alturas, Cal. The plant is under the direction of E. Moyer, superintendent.

Two New Plants Located in and Close by Boston

The Highland Sand and Gravel Co., Inc., Boston, Mass., was recently organized and plants for the production of sized material have been located at West Roxbury and Boston.

Texas Producer to Open Plant on Large Deposit

Texas Quarries, Inc., with offices at Austin, Tex., is opening a new plant and quarry at Round Rock, Tex., it is reported, where the company has leased a 3,000-acre deposit.

Joliet Gravel Co. Opens New Deposit; Lays Track

The Joliet Gravel Co. has opened a new bank of gravel near Joliet, Ill., about 40 miles south of the city of Chicago and is laying approximately 1,200 ft. of railroad track, under the supervision of R. J. Stone, the company's superintendent. Mr. Stone joined the company's forces on April 1 of this year. The office of the company is in charge of John Schwaab.

Operates Plants Producing Ready-Mixed Concrete and Cement Products

Decatur, Illinois, Operator Ships Sand and Gravel from Deposit 200 Miles Distant

THE W. G. Traver Supply Co., of Decatur, Ill., operates two unusually interesting plants, one for the production of ready-mixed concrete, the other for concrete block and other cement products. The concrete plant has been in operation for almost three years but the products plant was first put in operation on March 31 of this year.

All of the sand, gravel and crushed stone used in these plants are received by rail. The crushed stone comes from northeastern Illinois, a distance of about 100 miles, while the sand and gravel come 200 miles from northern Indiana which is the nearest section producing the kind required at this plant. Most of this material is used in the company's products, very little being sold direct. Shipments are received at the plant on a siding from the Illinois Central Railway.

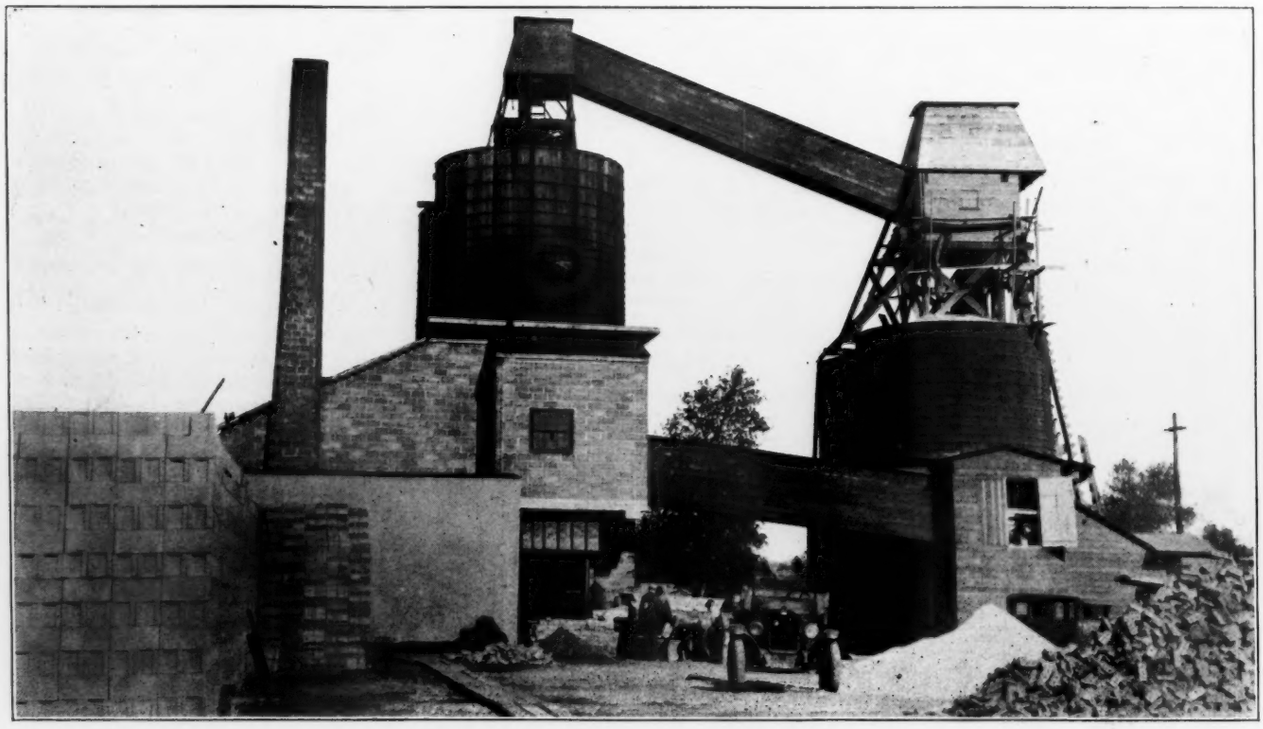
Central-Mixing Plant

The concrete plant has no unusual features but is designed to produce a consistently high grade of concrete in an economical manner. The building has concrete foundations and wooden framework with structural steel supports for the mixer, batcher and bins. The plant has a capacity of 150 cu.yd. of concrete in a 9-hour day.

The aggregate is dumped from cars into a concrete track hopper. The flow of material is regulated by a gate into a Link-Belt chain bucket elevator on 55-ft. centers. This discharges through a divided hopper into two concrete-bottom, circular wooden tanks of 4-car capacity each. One of these is used for sand and one for gravel.

Each of the bins has two gates, one discharging directly into trucks in a concrete tunnel under the plant. The other two gates feed to a volume batcher where the cement and Celite are added from sacks. Celite is used to prevent any possible segregation of the concrete on transit. The batcher discharges into a 28-cu.ft. T. L. Smith mixer in which the concrete is mixed from 3 to 5 minutes depending on the purpose for which it is intended. Water is measured from a tank with a calibrated water glass. Cement is unloaded in sacks from the cars and carried to the mixing floor by a slat elevator. The bucket elevator is gear driven by a 25-hp. Allis-Chalmers motor while the mixer is driven by a 30-hp. motor of the same make.

Deliveries of concrete are made in four Hug

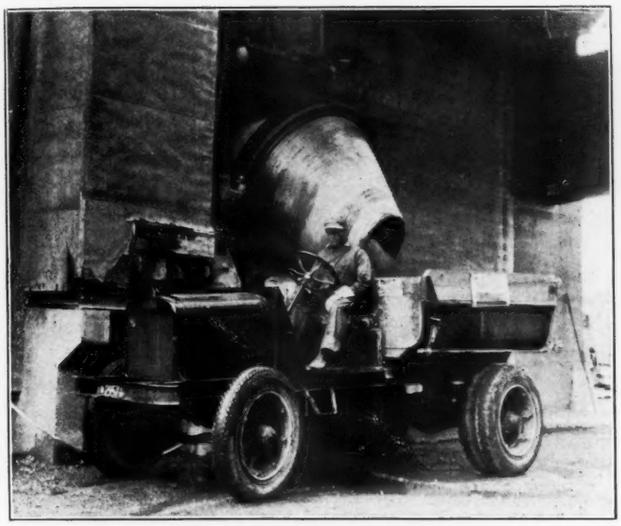


Cement-products plant (left) and ready-mixed concrete plant. Note aggregates conveyor (above) and cement conveyor connecting the two plants.

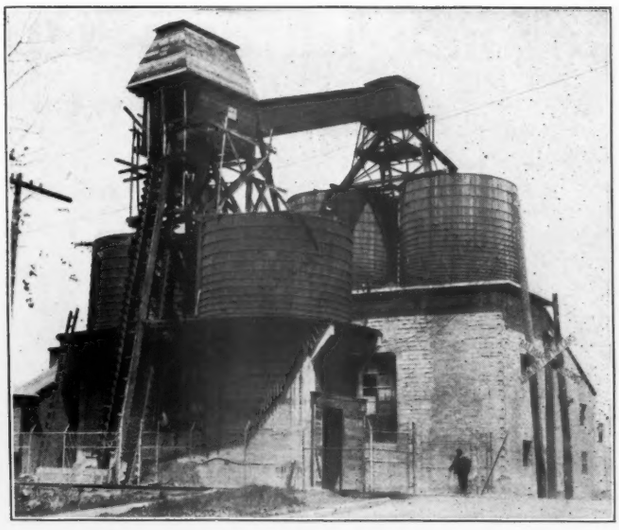
pneumatic-tired trucks with 2-cu.yd. dump bodies. These trucks are also used for delivering aggregates and concrete block. Most of the concrete sold is used for curb, gutter and sidewalk work and for building foundations.

Cement-Products Plant

The concrete-block plant, which went into operation early this year, has several features of interest. It is of concrete and concrete-block construction with structural-steel roof trusses and machinery and bin supports. The plant was erected by the company's own forces, while the steel was furnished and erected by the Mississippi Valley Structural Steel Co. The system of curing block and the fact that the concrete need not be elevated from the mixer to the block machine are unusual features.



Mixer discharging into 2-cu. yd. dump truck.

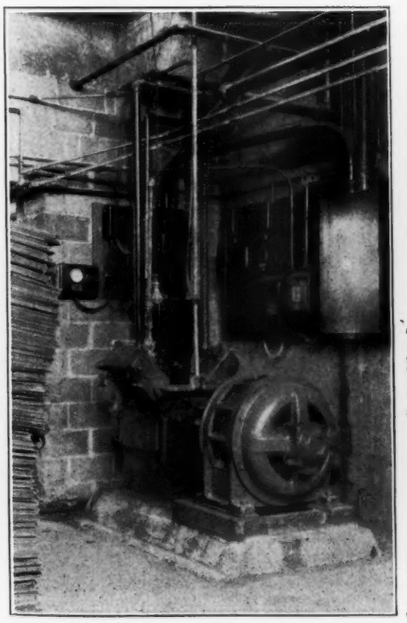


Concrete plant in foreground. Products plant at rear.

The material elevator feeding the concrete plant can also discharge through a separate chute onto a Link-Belt 42-in. belt conveyor enclosed in a wooden housing which runs to the top of the block plant. Here it discharges into two 6-car-capacity wooden tanks of the same type as those over the mixing plant. Each of the bins is divided into two sections for sand and gravel, crushed stone and Haydite. Haydite blocks constitute a large share of the business.

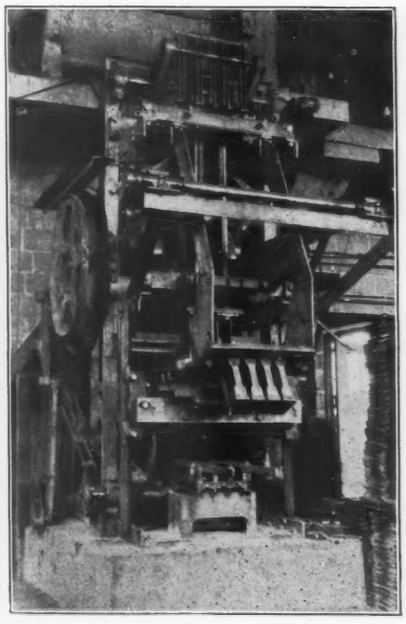
The slat elevator which elevates the cement and Celite to the mixing floor of the concrete plant also feeds a 42-in. Link-Belt conveyor which is enclosed in a wooden housing. This discharges to the second floor of the concrete block plant.

(*Continued on page 60*)



Air compressor and motor, and power-line terminals.

Mixer at right. Batcher and feeder above.



Block-making machine (stripper) is located below mixer.

German Railway Operates Own Plant to Obtain High-Grade Aggregates

Development in the Washing and Grading of Materials on Commercial Scale Lags

GERMAN research and practice in the field of concrete aggregates have, at least until a comparatively short time ago, lagged considerably behind its development in the knowledge of the cementing materials. During the past few years, however, there have been some notable publications in the German technical press reporting on researches on the effect of washing and grading aggregates, and in the September 5 issue of *Beton und Eisen* (Berlin), Dr. K. Schaechterle of the Wurttemberg Lines of the German National Railway told of a convincing practical test made by the railway management—the establishment of a washing-and-screening plant to supply suitably prepared aggregates for all of its construction work in Wurttemberg.

The general situation that led the railroad to install its own aggregates plant does not seem strange to those who have watched the development of the concrete-aggregates industry in this country. According to Dr. Schaechterle, the erroneous notion that the strength of the concrete depends only on the quality of the cement and the ratio of cement to aggregates in the mix is still, unfortunately, widespread. (This notion, of course, is not confined entirely to Germany). Even the 1925 German specifications for reinforced-concrete construction are vague in their requirements for aggregates, and base their assumption of strengths on the quality of cements used—that is, concrete of high strength is assumed from the use of special high-test cement instead of with commercial Portland cement, with no apparent regard for the fact that considerably higher strengths can be obtained from ordinary cement with suitably prepared aggregates and proper control of the mixing water than from special cements with natural aggregates of unsuitable composition.

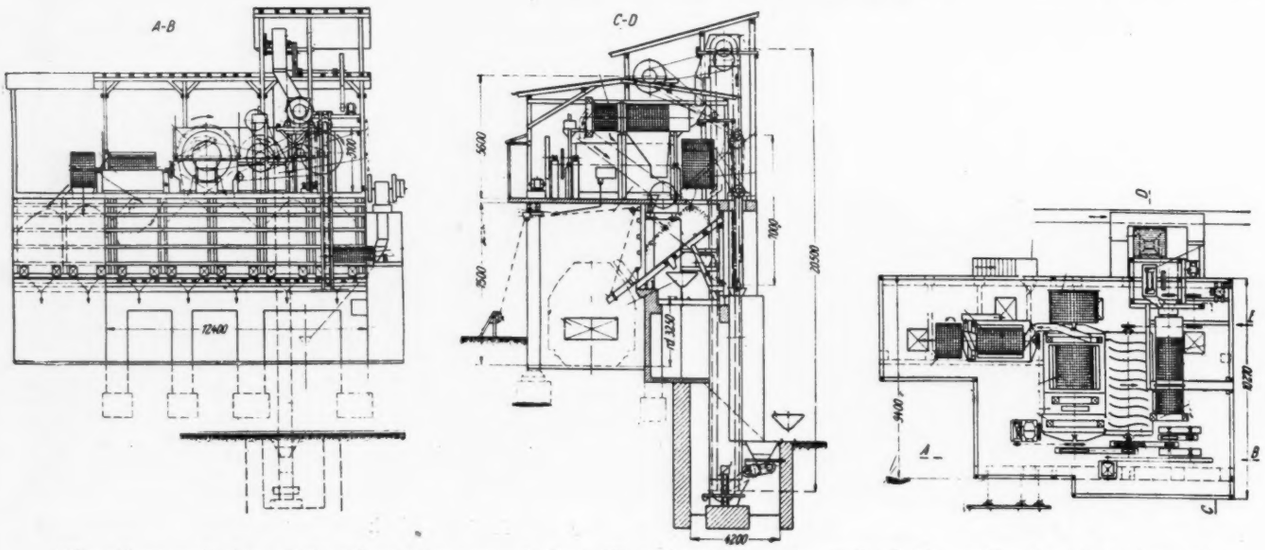
The 1925 specifications contain the following paragraphs referring to the aggregates:

"Sand, gravel, crushed stone or crushed blast-furnace slag shall be composed of particles as well mixed as possible. They must contain no injurious foreign materials. The grading of the aggregate is for the purpose so maintained that the voids of the mix are as slight as possible. . . .

"The concrete mix shall contain such a proportion of cement, sand, gravel, or crushed stone as to yield a dense concrete that guarantees the rust-proof enclosure of the reinforcing iron. . . ."

These indefinite requirements, of course, no longer correspond to the stock of knowledge concerning the aggregates, and one of the needs of the German concrete-making industry is a specification more definite in its requirements.

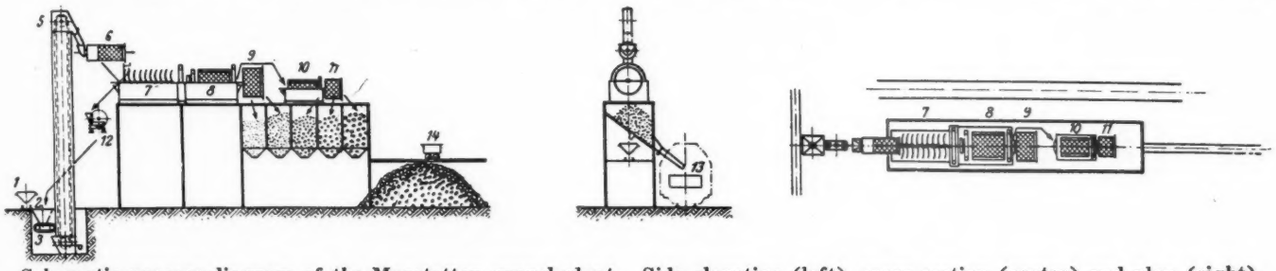
In practice, the obtaining of the aggregates is in most cases left to the contractor who, in turn, obtains his sand, gravel or crushed stone from a producer, and the material ordinarily obtained is simply pit or river-run sand and gravel, which are preferred on account of their ease and cheapness of handling. As is to be expected, the occurrence of natural mixes of a grading suitable for the preparation of concrete are extremely rare. Some deposits lack sand, others have too much of it, and so on. Aside from the haphazard composition of the material as dug, there is a considerable segregation of sizes during transporting and handling.



Elevations and plan of the Marstetten gravel plant. Plan (right), section A-B (left), and section C-D (center).

Consequently, when sand and gravel are drawn from the storage bins on the job, one batch may be largely gravel and the next batch almost entirely sand. It is apparent that under such conditions the achievement of a uniform concrete and a uniform strength can not be guaranteed. Under such conditions, too, it is impossible for the test specimens of concrete taken on the job to be a true criterion of the concrete that is being used.

Accordingly, "a completely-uniform composition of the concrete can only be attained," Dr. Schaechterle says, "by delivering and storing separately the individual components: sand, gravel, or crushed stone, and putting them together in each individual mix exactly in prescribed proportions."



Schematic process diagram of the Marstetten gravel plant. Side elevation (left), cross section (center) and plan (right). 1. Cars from gravel pit; 2. Grizzly and hopper; 3. Feeder; 5. Elevator; 6. Scalping screen; 7. Washer with agitating blades; 8. Stage washer and primary sand screen; 9. Secondary sand screen; 10. Primary gravel screen; 11. Secondary gravel screen; 12. Crusher; 13. Loading chutes; 14. Storage or waste.

It was long ago recognized that for the production of good concrete there must be a certain ratio between fine and coarse aggregate, for, with too little sand the mix is not dense and, with too much sand, the mortar is too lean and, in either case, the strength of the concrete is lowered. This, of course, accounts for the "particles as well mixed as possible" in the German specifications. In recent years the investigations of Fuller, Graf and others have developed further that the strength of the concrete requires an optimum grading of all successive sizes of the aggregates, while the actual size of the stone is of lesser importance. The sieve rule for sand given by Prof. Otto Graf of Stuttgart in his Der Aufbau des Moertels und Betons, widely accepted in Germany, is as follows:

Passing 0.24	mm. (approximately 0.01 in.).....	25 per cent
Passing 1	mm. (approximately 0.04 in.).....	35 per cent
Passing 3	mm. (approximately 0.12 in.).....	65 per cent.
Passing 7	mm. (approximately 0.27 in.).....	100 per cent

But there are many difficulties in the way of practical application of the sieve rules in Germany in actual construction. Gravel producers are not anxious to change production methods just because of scientific investigations. They supply not only concrete aggregates but also large quantities of road-surfacing material and ballast, and attempts to standardize the production of sand and gravel have as yet not made very encouraging headway.

In the meantime, the German National Railway has gone ahead vigorously in a campaign to make practical use of the results of the scientific investigations. In 1928 the railway issued a booklet, *Instructions for Mortar and Concrete,* with a mass of authoritative information for the use of its employees. For some time, too, the Wurttemberg lines have made a practice of buying cement from its Stuttgart office and of producing its own aggregates. In looking for suitable materials for this purpose a number of excellent deposits were found, but those considered best were the morainal gravel deposits in Upper Suabia. This material, of glacial origin, contains predominantly gravel from primary rocks and very hard, and sharp-grained sand rich in quartz. The oversize above 7 cm. (2¾ in.) comprises about 5 per cent of the total. Many thick strata are almost free from impurities, except in parts where a natural binding material has led to the formation of a hard conglomerate. Some layers, however, contain an excess of very fine sand and a considerable amount of clay. The strata unsuitable for aggregates are rather sharply differentiated from the good strata, and originally the deposit was worked by simply picking the choice strata and rejecting the unsuitable strata. Aggregates for the large railroad station at Stuttgart were produced in this way. With the expansion of the pit operations in consequence of increased demands this method of excavation was obviously unsuited and uneconomical and, at best, the choice between the good and the bad layers was always dependent on the laborer and his organs of sight. In the period since the war this method has become less and less satisfactory and, in 1925, the management of the railway decided to open a large pit and construct a washing-and-screening plant at Marstetten.

To determine just what improvements the material at Marstetten needed, samples were taken from several parts of the pit and thoroughly tested by Professor Graf in the laboratory of the Technical College of Stuttgart. A preliminary test showed the content of elutriable sand to be about 6 per cent. The test on the grading of the sand showed a large percentage of fines under 1 mm. (0.04 in.), with the widest variation from the Graf screen curve occurring between 0.24 and 1 mm.

To test the effect of the impurities (loam and clay) on the strength of concrete, part of the natural mix was washed so as to remove everything that could be floated in water. Then two series of test specimens were prepared, the first consisting of three each of washed and unwashed sand and gravel, in proportions of 1 part of cement to 5 parts of aggregate, and also of 1:10 in a plastic mix. A second series was similar, except that the concrete mix was "dry," that is, containing less mixing

water. In the first six specimens of the first series (plastic mix), the water added was 12.1 per cent by weight; in the remaining specimens of this series (made with washed materials), only 9 per cent of water was added to attain the same consistency. In the second series (dry mix) the cubes were also made of the same consistency whether washed or unwashed aggregates were used, although here the difference in the amount of mixing water was, of course, not so great as in the plastic mix series.

These test specimens were broken after 7 days, and the results showed that in the 1:5 mix, in the plastic concrete, the washing of the aggregates produced an increase in strength of 57 per cent, and in the 1:5 mix in the dry concrete an increase in strength of 47 per cent. The relatively greater increase in strength in the plastic mix is explained by the fact that the unwashed sand and gravel in the mixture needed more mixing water to reach an equal consistency. Thus the loam and clay impurities in the natural sand and gravel were found to be not only injurious because they interfere with the set, but also because they required the use of more mixing water.

These tests showed clearly the necessity for washing the materials from the Marstetten pit. By the washing of the sand and gravel, the material was greatly improved for the making of concrete. Tests showed that washing and the correction of the grading improved the strength of the concrete as much as 100 to 150 per cent.

The operation of the gravel plant at Marstetten is not described in great detail. In general, however, the material arriving from the gravel pit is discharged from cars onto a grizzly over a hopper, to be delivered by a feeder to an elevator and raised to the top of the plant. There it is put through a scalping screen, the oversize being chuted to a crusher in closed circuit, the crushed product being fed back to the elevator.

Everything through the scalping screen passes to a scrubber-equipped revolving screen known as a "sword washer" (*Schwertwaesche*), that is, a washer equipped with agitating blades. It then passes to the primary sand screen (No. 8 in the accompanying schematic drawing), the first part of which is a stage washer in which the materials, immersed in water, are lifted by buckets revolving on sprockets and passed from one stage to another. The greater part of this machine, however, is a sand screen immersed in a water box. Material rejected on this screen goes directly to the gravel screen, and material passing it goes to a secondary sand screen making two separations. The gravel screen and the secondary gravel screen (No. 10 and No. 11 in the sketch) produce three sizes of gravel, which are dropped into loading bins below.

Water for washing purposes is supplied by a high-pressure centrifugal pump from a sump in the gravel pit. By regulating the amount of water some improvement in the sand is accomplished hydraulically by the carrying away of some of the excess fines. However, there still remains an excess of material from 0.24 to 1 mm., and to supply the deficiency of the larger grains some of the gravel is finely crushed and mixed with the natural sand.

This plant has a production of 40,000 cu. meters per year (about 50,000 cu. yd.), and produces sand from 0 to 7 mm. (0 to ¼ in.), small gravel from 7 to 25 mm. (¼ in. to 1 in.) and large gravel from 25 to 45 mm. (1 in. to 1¾ in.). For a few special purposes, a fine gravel of 7 to 15 mm. (¼ in. to ⅝ in.) is also produced.

The plant has a capital value for land, structures and equipment of 111,431 marks, or about $27,850. The cost of producing a cu. meter of washed and screened material is 2.41 marks or 60 cents, or about 45 cents per cu. yd. Doctor Schaechterle also states that the cost of preparing the aggregates (presumably the difference in cost between prepared and unprepared aggregates) runs from 70 to 90 pfennigs per cu. meter of concrete, or about 12 to 17 cents per cu. yd.

"The expense for the preparation of the aggregates are largely offset by the guarantee of a uniform concrete of good quality," says Doctor Schaechterle. "A further advantage is that uniform concreting practices can be followed in the whole jurisdiction, thereby simplifying the control of construction. Trained and educated help is seldom at our disposal for the small and moderate-sized construction jobs and, for them, the delivery of concrete materials of known properties and composition is a great aid. Through the provision of uniform aggregates on all jobs it is possible to establish simple and easily comprehended rules for the production of concrete. For the control of the concreting work on the job and for making the consistency tests, we are training a 'concrete master' who will be directly responsible to the office of railway management at Stuttgart.

Rock-Asphalt Sales Drop Slightly But Increase in Value

Sales of native rock asphalt in the United States decreased 3.8 per cent in quantity, from 760,497 short tons in 1928 to 748,550 tons in 1929, but increased 0.3 per cent in value, from $4,060,276 in 1928 to $4,071,173 in 1929. The average value realized for each ton sold increased from $5.35 in 1928 to $5.44 in 1929. Eight-ninths of the total tonnage of rock asphalt sold was mined in two states—Kentucky and Texas. Minor amounts were produced in Alabama, in Oklahoma, in Utah, and in California.

In Kentucky the sales of rock asphalt increased 6.8 per cent in quantity, from 318,548 short tons in 1928 to 340,346 tons in 1929, 1.0 per cent in value from $2,757,547 in 1928 to $2,785,772 in 1929.

Three companies quarried limestone rock asphalt in Uvalde and Kinney counties, Texas, in 1929. Their production decreased 0.2 per cent in quantity, but increased 16 per cent in value.

San Francisco Bay Crushed-Stone Plant Ships by Rail, Water or Truck

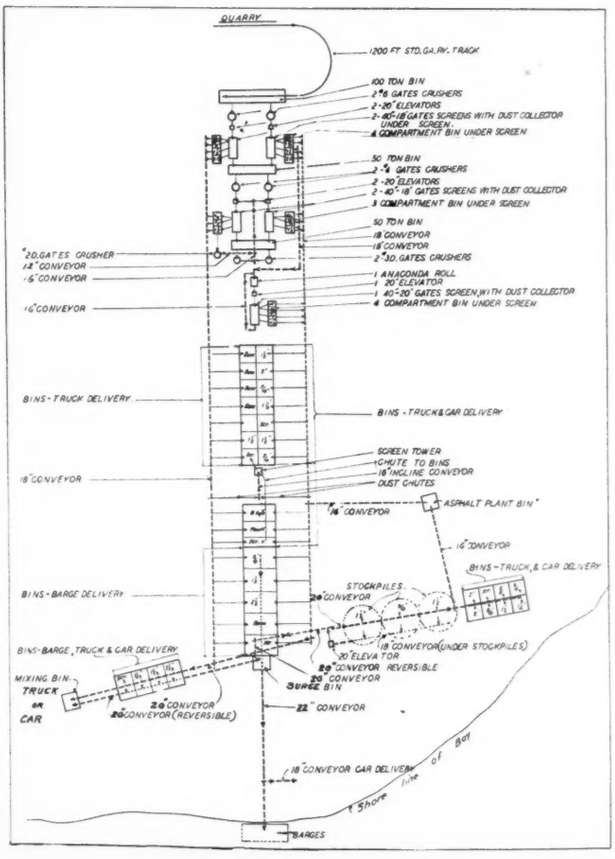
Two-Unit Operation at Richmond, Cal. Has Capacity of 125-150 Tons per Hour

THE crushed-stone plant of Blake Brothers Co. was established to supply materials for the erection of modern highways, buildings, dams and other structures in the San Francisco region. This quarrying, crushing and screening plant is located near Richmond, on San Francisco Bay, about 15 miles from San Francisco, Cal. It is so situated that the slogan adopted by one of the nearby cities, "Where Rail and Water Meet," is literally interpreted. Shipments of products by this plant are made by water, rail or truck with equal facility. This is a desirable condition, as it affords outlets for barge shipments which otherwise might not be secured.

The demands of the contractors are varied and they range from fine sizes to rock up to 2½ in. and in lots from 1 to 100,000 tons or more. To be in a position to give the contractor satisfactory service, the producer must so arrange his plant that he can prepare and store any number of sizes for subsequent shipments or mixes. This requires space for bins and stockpiles, machine shops, offices, mess-house and other buildings. The contour of the country is ideal for a plant of this sort. The quarry cuts into a big hill of blue traprock, having a hardness of 3 to 5, and weighing 168 lb. per cu. ft.

The quarry is oval in plan, the long axis running east-west, with a railroad outlet on the west side. It is 820 ft. long by 470 ft. wide, and has a height on the east side of 356 ft. The overburden of the quarry varies in depth from 15 to 20 ft. This is removed by a Marion No. 7 gas shovel and hauled in trucks to a glory-hole which has a capacity of 15,000 to 20,000 tons. A tunnel runs beneath the glory-hole with a 36-in. gauge track. The material is hauled thence to crushers and, after crushing, to bunkers, ready to be sold as road rock.

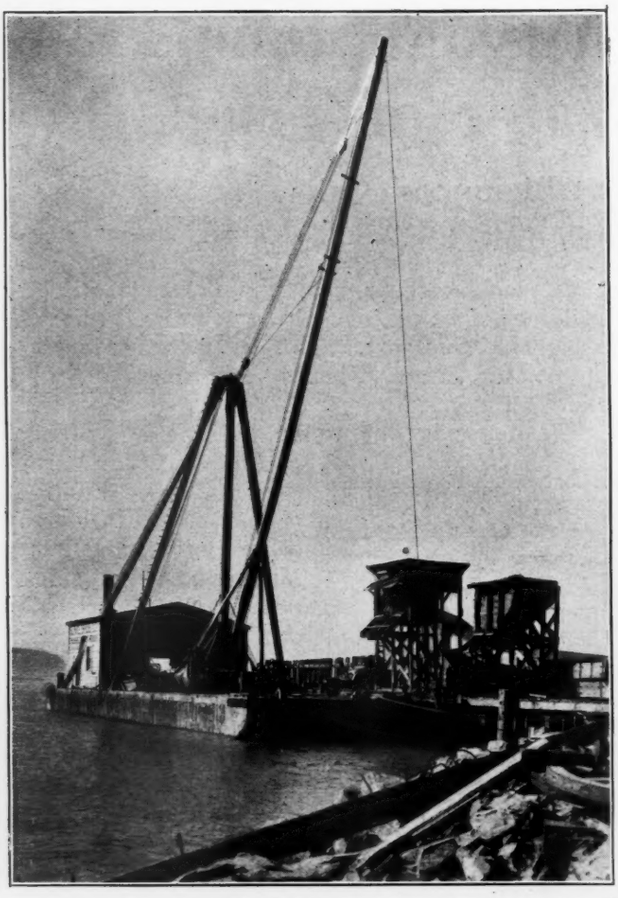
Coyote mining is the practice in the primary breaking of the quarry face. It consists in driving 4-ft. by 5-ft. drifts about 50 or 60 ft. into the face, and crosscutting the breasts of these drifts in both directions, approximately at right angles to the drift, until



Flow sheet of Blake Bros. plant.

Before the big plast in the quarry in June, 1926.

After the blast had dislodged 550,000 tons of rock.



Derrick barge used for discharging the flat barges.

Looking down into the quarry.

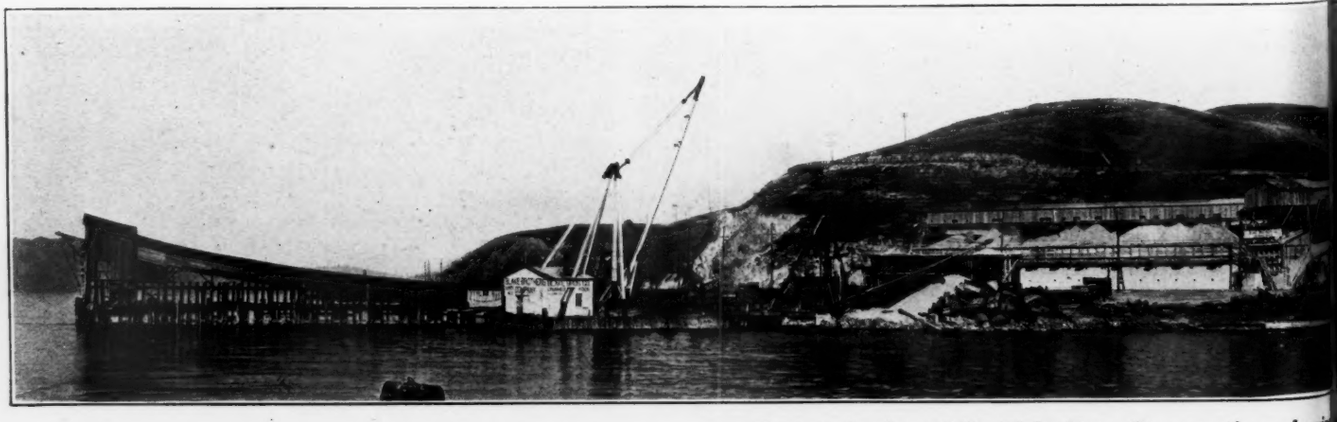
about 200 ft. of tunneling is completed. Drifting and crosscutting operations are with Chicago Pneumatic air drills and hand-mucking into wheelbarrows. Blasting in driving the drifts is with Giant gelatin or 20- to 60-per cent dynamite. At the completion of this operation, 5-per cent and 10-per cent Judson powder and 40-per cent dynamite priming are placed at intervals along the tunnel, and the portals tightly closed. The entire charge is connected to a 110-volt line for blasting. In June, 1927, one blast used 96,000 lb. of powder and broke down 550,000 tons of rock.

Bulldozing and plugging are resorted to in the secondary work to break the large pieces that can not be handled by the shovel-loading equipment.

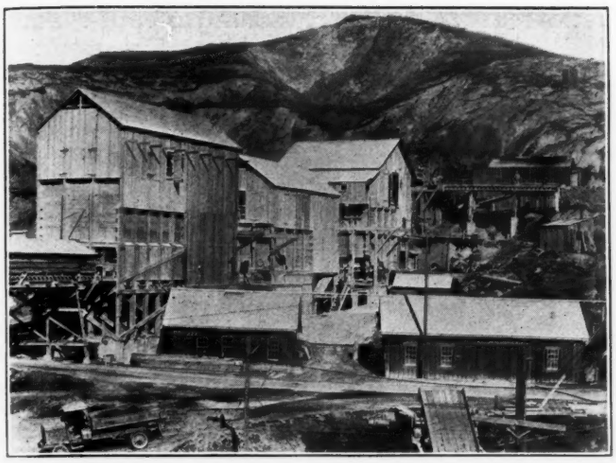
Rock is loaded by two Osgood No. 29 steam shovels, each of 1-cu. yd. capacity. Two 7-in. by 12-in. Porter locomotives are used for spotting and shunting. One 9-in. by 12-in. Vulcan locomotive handles a train of ten 4-cu. yd. Western side-dump cars from the quarry over 1,300 ft. of track, down a 1½-per cent grade, to the 125-ton bin in the crushing plant.

The capacity of the plant is rated at from 125 to 150 tons per hour when crushing through a 1½-in. screen and producing about 60-per cent ¾-in. minus. The largest commercial size prepared is 1½-in. to 2½-in. The demand for this is usually about 4 per cent of the plant capacity, but never exceeds 9 per cent.

The rock as received from the quarry is hard and tough and consequently does not break easily. The plant is built in two units, identical in a general way. The primary crushers are two No. 6 K Allis-Chalmers Gates, driven by two 75-hp. motors which also drive the elevators and screens. The crushers are set with a discharge opening of approximately 3-in., discharging directly to two Stephens-Adamson 20-in. elevator belts on 85-ft. centers, which discharge into a pair of Allis-Chalmers Gates revolving screens 40 in. in diameter, 18 ft. long, and set at an inclination of 1¼ in. per ft.,



Panoramic view of the Blake Bros. Co. operations showi[illegible]arry.

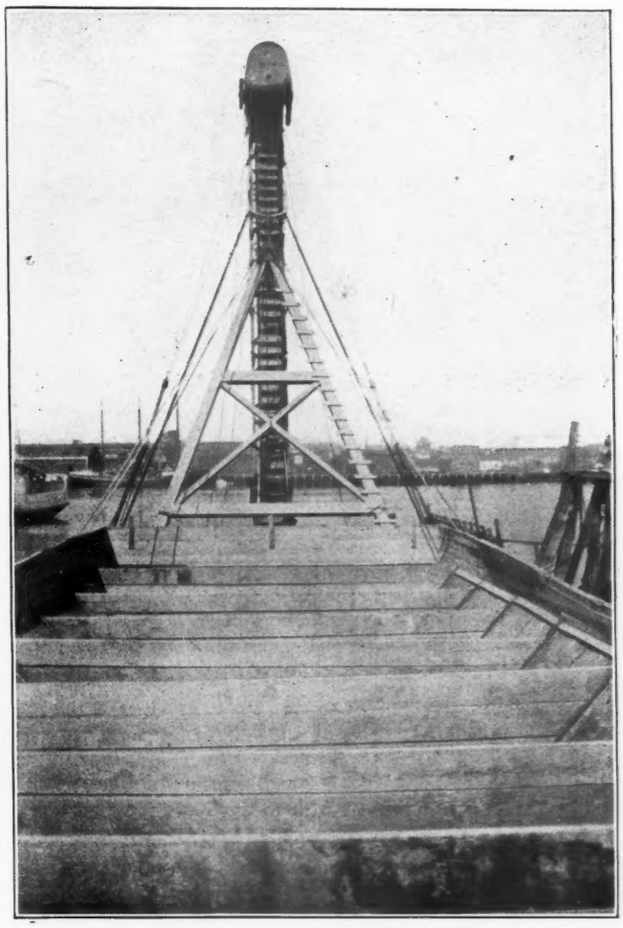


General view of crushing plant.

making 18 r.p.m. Perforated steel plates are the screening media. There are three sections of ¾-in. openings, two sections of 1½-in. openings, and one section of 2½-in. openings. Around each ¾-in. section is installed an 8-in. dust jacket. This jacket is nothing more or less than another set of screens surrounding the ¾-in. screen. The ¾-in. undersize product passes over a wire screen having ¼-in. by ⅜-in. openings which remove everything less than ¼-in. This product is discharged into separate bins of 50-tons capacity, for subsequent classification.

The screens and elevators are driven by the crusher motor. The primary-screen oversize discharges into an intermediate storage bin of 50-tons capacity from which the rock is discharged into the secondary system composed of two No. 4 K Allis-Chalmers Gates crushers driven by two 50-hp. motors, set to 2-in. and discharging to 20-in. elevators with 85-ft. centers and to screens as in the primary layout. The screens are 40 in. in diam. by 15 ft. long, assembled with three ¾-in. and two 1½-in. perforated screens and 7-ft. dust jackets around them. Each screen is driven by a separate 15-hp. motor.

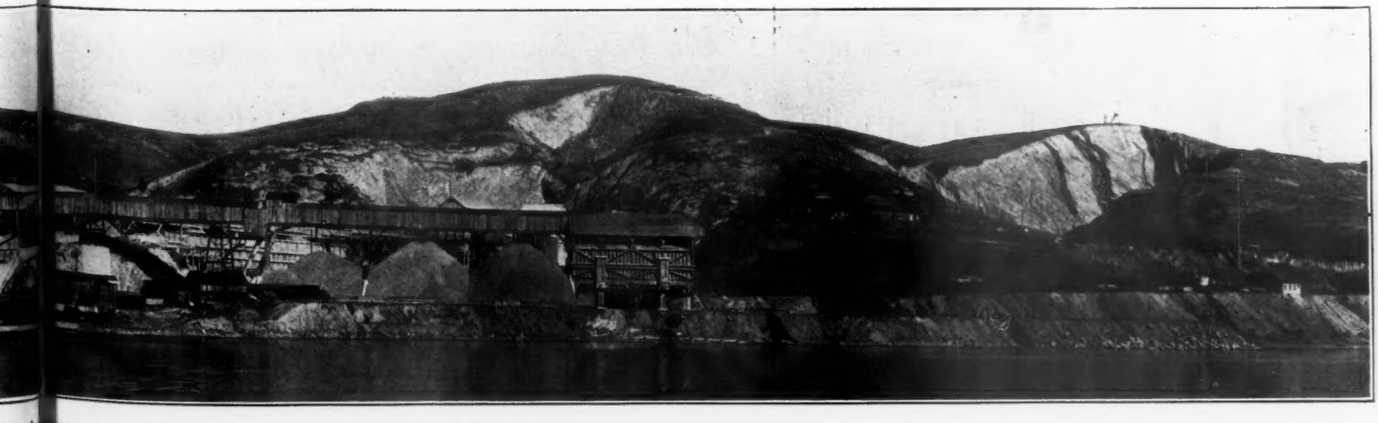
All of the elevators and conveyors installed in 1906 were furnished by the Stephens-Adamson Mfg. Co. and they are still in service although, as owner C. E. Blake explains, some pulleys and rollers have been replaced by units of local manufacture.



The barge San Pablo, showing elevator for discharging material.

The head pulleys and drive gears are still in excellent condition.

In the primary and secondary screen system the several products discharge into their respective bins from which they are withdrawn and conveyed to the stockpiles, as desired, or they may be sent by a conveyor to the roll section for further reduction. Oversizes from the secondary screens discharge into another 50-ton storage bin, from which they are fed to the tertiary system composed of two No. 3 D Allis-Chalmers Gates short-head crushers and one No. 2 D Allis-Chalmers Gates crusher set to ¾-in. The tertiary system is in



...arry, stockpiles, storage bins and water-front facilities.

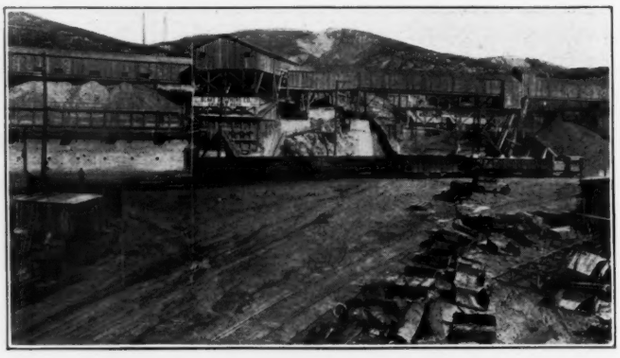
General plant view. Trainload of rock being discharged at right.

closed circuit with the secondary system by means of an inclined 16-in. conveyor, approximately 50-ft. centers, which returns the feed to the secondary elevators and screens. As previously stated, the sizes furnished to either ¾-in. or 1½-in. may be transferred to either storage bins or stockpiles but, in case more of the small sizes are required by the contractors, the rock from the several screens-storage bins may be diverted by a conveyor to a set of 40-in. by 15-in. Allis-Chalmers Anaconda rolls, operating in closed circuit with a 40-in. by 18-in. Gates screen, by means of a conveyor and an elevator. The roll is driven by a 50-hp. motor. A 15-hp. motor drives the elevator and screen.

The dust from the several dust jackets around the revolving screens is stored in bins until a sufficient quantity is on hand, when it is fed to the main conveyor and sent to a screen tower superimposed over one set of bins. In the screen tower are eight stationary screens, designed by Edwin Blake and set zig-zag at angles of 45 deg. These are wire screens with 8 openings per in. laterally and 3 openings per in. longitudinally. The oversize recovered in this manner, classified as birds-eye material, is stored in separate bins. The resulting fines or undersize are handled separately. A screen analysis of the fines recovered by the dust jacket is approximately 15 per cent of the total tonnage. The production of minus 200-mesh material is less than 1 per cent of the total feed.

A feature of this plant is that, when filling the storage bins with ¾-in. material, the conveyor tripper discharges onto a short, stationary grizzly with ½-in. spacing, placed over the bins for a more positively-finished size. The grizzly undersize produced in this manner is of comparatively small quantity. It is diverted to a separate bin compartment.

The flexibility of the flowsheet in this plant is attained by the use of belt conveyors and elevators laid out in such a manner that, by diversions, the products may be sent to shipping bins, to temporary storage bins, or to special mixing bins wherein definite quantities of the respective sizes are collected for shipment on special orders. Two main conveyors, on approximately 620-ft. centers, with counter-weight take-ups, run the full length of the crushing plant, discharging directly into bins for railroad, truck or water shipment. They are equipped with Diamond Cushion Edge belts, 18-in. by 5-ply, traveling at 320 ft. per min.

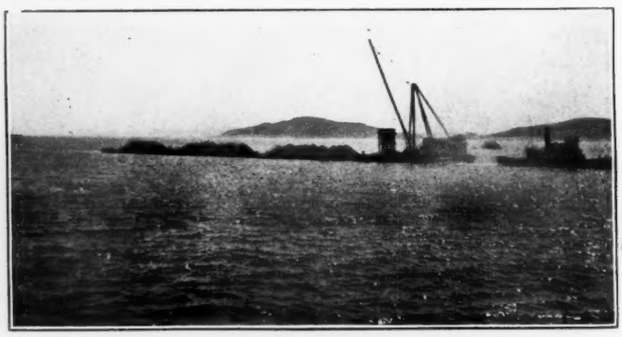


Railroad cars on spur track below storage bunkers and stockpiles.

For water shipment, however, a belt conveyor, on approximately 750-ft. centers, equipped with a 22-in. by 6-ply Diamond belt, traveling at 450 ft. per min., transfers material from the large bins to the barges at the dock. A Merrick Weightometer, assembled on this belt, has a rated capacity of 432 tons per hour, but sometimes this is exceeded.

One 16-in. conveyor, on about 50-ft. centers,

Belt conveyors are used extensively to transport material.



Tugboat with derrick barge and loaded flat barges.

View of the machine shop.

serves to put the primary units into closed circuit with a set of rolls as necessity demands. The main conveyors also serve two cross-over conveyors, one of which discharges to stockpiles and bins, the other to additional storage bins or to special mixing bins. The cross-over conveyor leading to the stockpile and shipping bins is divided into two parts. The first part (nearer the main conveyor) is reversible in direction. By reason of this reversible feature, reclamation of the stockpile products is facilitated. The tunnel conveyor beneath the piles has an 18-in. by 5-ply belt and discharges into an elevator which, in turn, discharges to the reversible conveyor for distribution in either direction to bins for shipment by railroad or by barge. The second reversible conveyor, 20-in. by 5-ply belt, collects certain sizes from a set of barge-bins and discharges to a mixing bin at one end for loading cars or trucks, or to a surge-bin, at the other end, to load the barge conveyor. In this plant are 17 con-

Tugboat and conveyor barge.

veyors and 7 elevators, nearly all of which have Diamond belting. One of these belts has been in service since 1913.

To meet the demand of some road builders, there is an asphalt-mixing plant on the property. It is ideally located in that it is convenient to the source of the aggregate comprising the mixture. Given quantities of the respective sizes are readily obtainable by means of the conveyor system. One conveyor draws from the main crushing-plant conveyor, and another from the ¾-in. or the 1½-in. stockpile. These conveyors discharge into three storage bins over the asphalt plant. The final mixtures are made according to the contractors' desires. The asphalt mixtures are shipped by truck

Conveyor from stockpile for loading cars and barges.

over a radius of 15 miles. This asphalt plant also produces an oil-rock mixture that is used in building up shoulders on the highways.

One of the barges of this company, the *San Pablo,* with a capacity of 550 tons, is used for water shipment of its product. It is equipped with seven compartments for keeping separate the respective sizes of rock during shipment. The barge is loaded by direct discharge of the conveyor from the storage barge-bins. It is discharged by means of a 20-in. by 5-ply conveyor traveling at 350 ft. per min., running lengthwise beneath the bins and driven by a 7½-hp. Allis-Chalmers motor. The conveyor discharges into a 20-in. belt-and-bucket elevator which can be swung around a radius of 180 deg., and variously inclined by means of a boom. This elevator is driven by a 20-hp. Allis-Chalmers motor. This arrangement provides not only for a rapid unloading of the barge, but also takes care of radial and elevation difficulties because of the bin locations and the tides at the discharge terminals. The unloading operations are at the rate of 150 tons per hour. Belts are driven by a 20-hp. motor. Power is generated by a 45-hp. Holt gas engine driving an Allis-Chalmers 20-kw., d.c. generator.

The derrick barge is equipped with 1-cu. yd Hayward buckets. The three flat barges have a capacity of 450 tons each.

Rip-rap, ranging from 100 lb. to 2 or 3 tons, and used for the sea wall, is produced at the plant. It is handled in 2-cu. yd. skips which are hauled by

truck to the derrick upon the wharf and transferred to barges.

Standard-gauge railroad cars are delivered to Blake Spur, about one-half mile from the plant, by the belt line that is operated by the Atchison, Topeka & Santa Fe R. R. Cars are handled from spur to plant by a 20-ton Whitcomb locomotive which is capable of handling 5 to 6 cars per trip and which has delivered 35 cars of 50-ton capacity per day.

Located approximately 500 ft. from the quarry is a 1,000-ton bunker in which is stored second-class material used for fill. Standard-gauge railroad cars as well as trucks can be loaded from this bunker. A 36-in. track on top handles the quarry cars.

A well-equipped machine shop on the property takes care of any ordinary repair job that comes up. A suitable engine house facilitates repairs on the locomotives.

The plant was laid out and designed by Edwin T. Blake, vice-president. Other officers of the company are: Anson S. Blake, president; Henry C. Steinbach, secretary; Gustave Kuppe, treasurer; and J. N. Asmussen, superintendent.

The Diesel Engine's Invasion of the Industrial Power Field

The Diesel is the most efficient engine in the world—that is, the Diesel is successful in getting more work out of a heat unit than any other power developer, according to Houghton's *Black and White.*

In each B.t.u. there is enough heat to raise the temperature of one pound of water one degree F. If all of the heat in the unit could be converted into mechanical energy it would be sufficient to lift a weight of one pound to a height of 778.1 ft.

The Diesel engine is so efficient that it will enable each heat unit to lift the weight higher than any other engine, in some instances to over 40 per cent of the "perfect" height of 778.1 ft.

But an efficient engine is not necessarily an economical one. In certain coal regions where coal is cheap and fuel oil is expensive, a Diesel engine would be just as efficient as anywhere else, but it might not be nearly so economical as a very inefficient steam engine. Thus the efficiency of a steam engine may be only 10 per cent, while that of a Diesel engine is 40 per cent. Yet it is possible for that steam engine to be more economical because of the cheapness of coal as compared with oil.

Economy means, "make a dollar do as much work as possible" while efficiency means, "make a heat unit do as much work as possible."

The unequaled efficiency of the Diesel engine has been acknowledged, but it has had difficulty until recent years, in competing with coal.

When the Diesel engine was invented, in the early nineties, it was thought by many that it would quickly eliminate the steam power plant. But Dr. Rudolph Diesel, its famous inventor, knew better. He said:

"The Diesel engine is not and will not be a cheap engine; it aims to be the best engine and must be constructed of the highest class of materials with the most skilled workmanship."

At first the advance of the Diesel engine in the United States was slow. Today it is rapid. Moderate size central stations such as the typical municipal power stations, are using the Diesel more and more. The cost of installation is said to be lower than that of steam plants and it is claimed that the upkeep cost is lower.

Even the larger power plants are making use of the Diesel for standby purposes—for carrying peak loads—and even for driving some of the interconnected plants.

Roughly, in the average municipal power station driven by the Diesel engine, each gallon of fuel oil produces 10 kw.-hr. Hence the fuel cost for oil is approximately ½ cent per kw.-hr.

For intermittent service, the Diesel engine is excellent. It may be started and stopped on a moment's notice. There are no standby losses; no waiting to heat the boiler and generate steam.

One of the present tendencies is toward lighter-weight and higher-speed Diesels. These engines are designed for application to industrial work and to portable service as on shovels, cranes, ditchers, draglines, industrial locomotives, railway motor cars, and the like. They are even invading the air, and may render the gasoline motor obsolete in the air.

Not so many years ago it was said that the internal combustion engine had no business in industries where exhaust steam can be utilized, as in the creamery field, textile, paper, laundry and similar fields. But the Diesel engine is invading even these industries. However, it is not likely that the Diesel will ever entirely or even nearly supplant the steam boiler and engine in these industries. The utilization of exhaust steam gives the steam plant a very high overall efficiency which is almost impossible to beat.

What is more, the efficiency of the Diesel engine has been still further increased by utilizing the heat in its exhaust. There is a heating device on the market which generates steam when heated by the exhaust of an internal-combustion engine. Diesel engine exhaust is hot, and when the exhaust is sufficient in quantity it may as well be used. But of course the amount of heat available is limited. There is less available heat in Diesel engine exhaust than in steam engine exhaust because at ordinary temperatures gas exhaust has no "latent heat" to give up, such as possessed by steam.

When to Tighten Silent Chain

When to tighten a silent chain may be determined by laying a straight edge on top of the chain and standing on the chain in order to bring all the sag on top, under the straight edge. If the amount of sag measures 5½ in. or over, one link of chain should be removed.

Lime Association Paves Way for Progress at 1930 Gathering in Chicago

Captains of the Calcium Industry Analyze Future Demand and Markets for Product

THE expenditure of $45,000 for a national advertising campaign to acquaint the public with the importance of lime, and a program for the collection and distribution of statistics on production and shipments were among the important actions taken by the National Lime Association, which gathered in Chicago June 3 and 4 in annual convention. Seventy-two producers were present.

The sessions and the annual dinner were held in the Michigan room of the great Edgewater Beach Hotel. The first session was called to order Tuesday, June 3, 1930, at 10:30 by Bernard L. McNulty, president and general manager of the Marblehead Lime Co., Chicago, and chairman of the association's board of directors. After short preliminary remarks he introduced the first speaker on the program, Fred W. Sargent, president of the Chicago & North Western Ry., who, in a cordial manner, not only welcomed the convention to Chicago, but discussed numerous matters that are of vital interest to railroads and lime producers. He emphasized the benefits that follow an exchange of ideas between operators in the same industry. He explained how railroad companies nowadays are eager to give shippers the utmost in service but that there prevails an over-regulation of railroads which sometimes prevents good service. Railroads have nothing to say about tariffs or rates. The impotence of railroad officials recalled to Mr. Sargent an incident in Duluth, some years ago, in which friends were seeking a desirable occupation for a deaf-and-dumb man, and the suggestion was made that he be placed upon the railroad company's board of directors. Mr. Sargent foresees expanding markets for lime in fields as yet scarcely recognized, as in disinfectants, many chemical uses, in water purification, in soil treatment, and in poultry food. He concluded by explaining Chicago's industrial prominence, its accessibility to 57 per cent of the country's population by overnight railroad sleeper trips, its magnified criminal proclivities, its beauty, and its hospitality.

Upon motion, duly carried, the stated roll call was omitted, and Ralph P. Wilton, president of Steacy & Wilton Co., Wrightsville, Pa., presented the association treasurer's report for the past year. The finances are in good condition, as evidenced by a substantial balance of approximately $16,000 to carry into next year. The report was approved.

Norman G. Hough, president and general manager of the association, occupied the balance of the forenoon session with a scholarly, forceful analysis of the present condition of the lime industry, his discussion being predicated upon the idea that "convention days are check-up days." Much of Mr. Hough's discourse dealt with the dearth of available statistics about the American lime industry and the real need for the adoption of a feasible system of collecting such data. In the present age every successful industry is found to depend, to a considerable degree, upon statistics collected from individual operators in the industry. There are 81 member companies in the association whose separate data on production and distribution could be integrated by the association headquarters into valuable generalities for all members. Numerous large charts were exhibited to show a proposed system of collecting monthly statistics. These elicited considerable discussion, the general opinion being that the system should be inaugurated promptly. Non-member lime companies would be given opportunity to file monthly reports. In all cases, absolute privacy would be given the data submitted by individual operators. The association would compile the data by districts and states and distribute the statistics to all who cooperate. The figures for production and shipments would be variously classified as quicklime and hydrated lime, for agricultural, construction, finishing, and chemical uses.

Following the address, a motion was carried to put the proposed statistical system into operation immediately. Many delegates participated in the discussion that preceded the vote, special interest centering upon the advisability of having the reports include average prices for a month.

Mr. Hough stated that the public demands efficient production and distribution and is willing to pay enough for products to cover reasonable legitimate profits to producers. He strongly denounced all sorts of unfair selling practices, including secret agreements and rebates, and reminded the convention that the Federal Trade Practice rules, adopted last year, cover both non-members and members of the association. He also explained the point that the association itself cannot enforce the observance of any regulation although it can exercise considerable influence.

The association has adopted the slogan, "Rely on lime, tested by time," and this is printed on the new official insignia. In concluding his address on "What's ahead for the lime industry?" Mr. Hough spoke for sound practices in business, and expressed optimism in numerous potential opportunities for expansion into relatively new markets.

What's Ahead for Lime?

The Tuesday afternoon session was devoted to addresses by members of the association's headquarters staff and were technical in nature. W. V. Brumbaugh, assistant secretary, spoke on the subject, "What's Ahead for Chemical Lime?" He prefaced this address, however, by announcement of numerous accomplishments and activities of the association during the past year, mentioning, among other topics, the advertising campaign in national trade journals and a booklet about lime and its uses, distributed liberally among dealers, salesmen and engineering college students about to graduate.

Norman G. Hough

Among the possible fields for an increased consumption of lime, he dwelt upon the flotation of minerals in the concentration of metallic ores. In most milling plants, it is necessary to maintain alkalinity in the water used and this is most readily and economically accomplished by the addition of lime. Larger plants generally use quicklime, while smaller plants use hydrated lime. It is estimated that the average annual consumption of these products is around 85,000 tons and this market could be considerably enlarged.

The oil or petroleum industry is another large consumer of lime, in scrubbing gas, for softening water used in boilers and in processes, for desulphurizing crude oil, and in the refining of greases. Estimates place the cost of lime at about 75 cents per barrel of crude oil treated. Research has proved that lime can supplant caustic soda in the scrubbing of gas, with a considerable saving in operating cost and at greater convenience.

Large quantities of lime are consumed in the paper industry and the demand could be materially increased by proper research and publicity.

A somewhat recent development is the use of burned lime in place of raw limestone as a flux in steel metallurgy. The practice has not been accepted generally, one objection being that, in its use, there is not the ebullition of gas that steel men look upon as an advantage during smelting. However, as steel operators can be made to appreciate the big savings in freight and in fuel that will attend the use of quicklime as flux, it is believed that they will overcome their notions about ebullition. Burned lime is being used experimentally in a Pittsburgh open-hearth plant with good results.

A great market for lime could be developed in the purification or softening of water by cities. At present, lime is used successfully for this purpose by 110 cities and it performs the same functions as soda-ash at much less expense. The annual consumption of lime for this purpose is more than 150,000 tons.

H. A. Huschke, director of the association's agricultural department, discussed "What's Ahead for Agricultural Lime?" He gave an elementary discussion of soil acidity, plant foods, proteins, and the interesting functions of plant-root bacteria. Such bacteria require a soil that is free from acidity. Plants that rely upon these organisms for their growth, therefore, must be protected by an alkaline substance such as lime.

The addition of lime to heavy clays or other soils that have a tendency to pack is beneficial in numerous ways, such as loosening the earth to admit circulation of air to plants and bacteria, lessening the effort necessary in plowing, harrowing and cultivating, and in increasing crop yields.

Mr. Huschke believes that lime should therefore be regarded as a vital element in all plant-food preparations and its use is recommended in high-analysis fertilizers. The average cost of liming one acre of land the first time is $13.61. The effect of the application will be felt for about four years, while the average betterment in crop will be about $10.26 per year. Several large charts were exhibited to prove the efficiency of lime additions to crops of vegetables, grains, hays, and fruits.

The association's agricultural department has three main lines of activity which are designated, respectively, as promotion, education, and research. Periodic releases of news items are made to the agricultural press, pamphlets and bulletins are published, and research is encouraged at agricultural experiment stations.

"What's Ahead for Construction Lime?" was discussed by C. E. Ellsworth, the association's construction engineer. He outlined the industrial changes in the use of lime, which originally was the vital constituent in all cementitious materials but which, within the past few years, has been largely replaced by portland cement. He presented strong arguments for lime. He claimed that there would be no staining nor efflorescence on building walls if lime were used exclusively; that, in the building of brick chimneys, lime has proved superior to cement as mortar; and that, in ordinary brickwork, lime gives a stronger bond. He exhibited charts to show the relative strengths of brick walls laid with lime mortar and with cement mortar.

Radio-Salute Dinner

The annual banquet began at 7 p.m. This was termed a radio-salute dinner because the latter

portion of the program was received by radio over a nation-wide network and was one (the last one) in a series of broadcasts that have featured America's basic industries. Between courses of the dinner the members were entertained by local vaudeville artists.

After the splendid dinner, the guest speaker, Col. George T. Buckingham, prominent attorney of Chicago, gave a brief outline of the history of the law and the institutions for controlling big corporations. He ascribed the Sherman Act of 1890 to the conditions that prevailed before there were any massive corporations such as prevail today. The provisions of the act are quite unsuited to current needs of industry but large companies are obliged to keep within them. He recommended the maintenance of statistical bureaus in every major industry to keep members so informed on national conditions as to avoid waves in production that make business unstable. He advised operators to avoid litigation.

Promptly at 9 o'clock attention was given to the radio program which was arranged by the Westinghouse Electric & Mfg. Co. as a tribute to the lime industry. Excellent musical numbers by an orchestra of fifty pieces were interspersed with bits of information about lime and the development of its industry.

Then Norman G. Hough, president of the association, delivered an address on "Lime—Its Economic Importance and Use in Our Modern Scheme of Life," the complete text of which was published in the June 4 issue of PIT AND QUARRY.

Wednesday Session

The last session of the convention was opened at 10:15 Wednesday, June 4, B. L. McNulty, president and general manager, Marblehead Lime Co., Chicago, Ill., presiding. The first speaker was Pres. Norman G. Hough who discussed prevailing business conditions throughout the country, especially those within the lime industry, and again mentioned the proposed establishment of a statistical bureau in the association.

W. J. Chandler, of the Thomsen-Ellis Co., Baltimore, Md., next spoke about the recent nation-wide advertising campaign that has been pushed, by the association, in trade journals. He analyzed the approximate distribution of lime in the chemical, building construction, and agricultural markets, and explained the corresponding distribution of full-page advertisements to journals in those respective fields. To date these ads have been carried in 3 chemical journals, 11 construction and architects' journals, and 5 agricultural journals. The proposed expansion of this program was then outlined, this to depend upon the convention's authorization of the necessary budget.

Mr. McNulty next read many enthusiastic telegrams from distant persons who had tuned in on the radio salute the preceding evening.

Mr. Hough discussed the keyed results of the advertising campaign received to date and the ideal objectives of the proposed expanded campaign.

Considerable discussion followed his presentation of a proposed schedule of terms and discounts that would apply to sales of lime. Using data secured from many producers, averages had been prepared, and these showed the following general practices:

Bulk lime—lump, pebble, pulverized—discount 25c per ton.

Lime in 180-lb. net barrels, steel or wood—discount 5c per bbl.

Lime in 280-lb. net barrels, steel or wood—discount 10c per bbl.

Hydrated lime—bulk or package—discount 25c per ton.

Pulverized lime—package or barrels—discount 25c per ton.

All discounts allowable 10 days from date of invoice, 30 days net.

The discussion resulted in carrying a motion that this matter of discounts be tabled until the next meeting.

Mr. Hough then presented his budget for the coming fiscal year—July 1, 1930 to June 30, 1931. Owing to the natural expansion of the association's activities the budget is slightly larger than for the past year. The proposed advertising campaign adds $45,000 more to the budget. Mr. Hough stated unqualifiedly that he would not suggest nor ask for any increase in dues to make up the greater needs but hoped that greater income could be developed by securing a greater membership in the association. There was such enthusiasm among the members present that a motion to approve the budget was carried unanimously.

Geo. B. Wood

Elect Officers and Directors

The election of regional directors was announced as follows:

District 1—J. R. Linney, Chazy Marble Lime Co., Chazy, N. Y.; C. L. Montgomery, Vermarco Lime Co., West Rutland, Vt.

District 2—Reed C. Bye, Warner Co., Philadelphia, Pa.; S. Walter Stauffer, J. E. Baker Co., York, Pa.

District 3—Ray C. Noll, Whiterock Quarries, Inc., Bellefonte, Pa.

District 4—No election.

District 5—G. J. Whelan, Kelley Island Lime & Transport Co., Cleveland, O.

District 6—Geo. J. Nicholson, Inland Lime & Stone Co., Manistique, Mich.

District 7—B. L. McNulty, Marblehead Lime Co., Chicago, Ill.; E. S. Healey, Glencoe Lime & Cement Co., St. Louis, Mo.

District 8—R. C. Brown, Western Lime & Cement Co., Oshkosh, Wis.; James Fryer, Secy., Wisconsin Lime Mfrs. Assn., Chicago, Ill.

District 9—No members.

District 10-11—F. C. Cheney, Cheney Lime & Cement Co., Birmingham, Ala.

District 12—J. F. Pollack, Ash Grove Lime & Portland Cement Co., Kansas City, Mo.

District 13—I. A. Ogden, Dittlinger Lime Co., New Braunfels, Tex.

District 14—J. S. McMillan, Roche Harbor Lime & Cement Co., Roche Harbor, Wash.

District 15—C. M. Cadman, U. S. Lime Products Co., San Francisco, Cal.

After temporary adjournment of the session as a whole, the directors held a private meeting. The session then re-convened and announcement was made of the election of the following officers for the ensuing year:

Norman G. Hough, president and manager;

R. P. Wilton, secretary-treasurer;

W. V. Brumbaugh, assistant secretary-treasurer;

B. L. McNulty, chairman, board of directors;

Other members of the executive committee: J. M. Deely, J. M. Gager, H. B. Mathews, Reed C. Bye, and one vacancy to be filled.

On Wednesday afternoon about fifty of the convention attendants were guests of the Marblehead Lime Co. In private buses and taxis they were driven, along Chicago's beautiful water-front boulevards, to the southern part of the city, where about one and one-half hours was spent at the company's large, modern, lime-manufacturing plant. Crushed limestone is received here from Rogers City, Mich., by boats, so that this is a lime plant without a quarry. B. L. McNulty and W. J. Stewart, of the Marblehead company, acted as hosts, and the inspection proved most enjoyable and interesting to all.

Registration

W. R. Anderson, Ash Grove Lime & Portland Cement Co., Kansas City, Mo.

W. R. Atteberry, Green River Lime Co., Greensburg, Ky.

F. H. Belden, Marblehead Lime Co., Chicago, Ill.

Fred A. Boeye, North American Cement Co., New York, N. Y.

B. Brennan, Valders Lime & Stone Co., Valders, Wis.

H. E. Brookby, consulting engineer, Chicago, Ill.

R. C. Brown, Western Lime & Cement Co., Oshkosh, Wis.

W. V. Brumbaugh, Natl. Lime Assn., Washington, D. C.

Chas. C. Bye, Warner Co., Philadelphia, Pa.

Reed C. Bye, Warner Co., Wilmington, Del.

Chas. M. Cadman, U. S. Lime Products Co., San Francisco, Cal.

E. C. Carter, Sheboygan Lime Works, Sheboygan, Wis.

F. C. Cheney, Cheney Lime & Cement Co., Birmingham, Ala.

J. H. Chiles, Austin White Lime Co., Austin, Tex.

C. H. Corbett, Valve Bag Co., New York, N. Y.

B. L. Corson, G. & W. H. Corson, Inc., Plymouth Meeting, Pa.

F. W. Cramer, York Valley Lime & Stone Co., York, Pa.

N. J. Chandler, Thomsen-Ellis Co., Baltimore, Md.

J. M. Deely, Lee Lime Corp., Lee, Mass.

J. G. Drummond, Indiana Limestone Co., Bedford, Ind.

C. E. Ellsworth, National Lime Assn., Washington, D. C.

J. S. Elwell, Marblehead Lime Co., Chicago, Ill.

W. Fitzroy, Hunkins-Willis Lime & Cement Co., St. Louis, Mo.

B. A. Ford, Valve Bag Co., New York, N. Y.

J. B. Fox, West Branch Lime Co., Williamsport, Pa.

James Fryer, Wisconsin Lime Mfr. Assn., Chicago, Ill.

J. M. Gager, Gager Lime Mfg. Co., Chattanooga, Tenn.

E. J. Groth, J. F. Groth & Son, Cedarburg, Wis.

J. F. Gruber, North American Cement Corp., Hagerstown, Md.

C. R. Haden, Haden Lime Co., Houston, Tex.

E. C. Harsh, *Rock Products*, Chicago, Ill.

W. R. Hazzard, Warner Co., Philadelphia, Pa.

E. S. Healey, Glencoe Lime & Cement Co., St. Louis, Mo.

A. J. Hoskin, PIT AND QUARRY, Chicago, Ill.

Norman G. Hough, president, National Lime Assn., Washington, D. C.

G. W. Hughes, Inland Lime & Stone Co., Manistique, Mich.

D. S. Hunkins, Hunkins-Willis Lime & Cement Co., St. Louis, Mo.

H. A. Huschke, National Lime Assn., Washington, D. C.

C. H. Kammann, Ste. Genevieve Lime & Quarry Co., St. Louis, Mo.

Karl P. Kammann, Ste. Genevieve Lime & Quarry Co., St. Louis, Mo.

Frank G. Krumholz, Universal Gypsum & Lime Co., Chicago, Ill.

W. J. Kuntz, Blaw-Knox Co., Pittsburgh, Pa.

D. H. Jenkins, Jno. W. Jenkins & Son, Springfield, O.

Joseph La Bell, Amsden Lime Co., Amsden, Vt.

A. B. Mack, Kelley Island Lime & Transport Co., Cleveland, O.

H. B. Mathews, Jr., Mississippi Lime & Material Co., Alton, Ill.

M. R. Mathews, Marblehead Lime Co., Chicago, Ill.

B. L. McNulty, New England Lime Co., Marblehead Lime Co., Chicago, Ill.

N. S. Meyers, Limestone Products Co., Menominee, Mich.

C. L. Montgomery, Vermarco Lime Co., West Rutland, Vt.

W. H. Moores, Moores Lime Co., Springfield, O.

E. A. Nast, Nast Limestone Co., Eden, Wis.

Walter M. Neill, Valve Bag Co., New York, N. Y.

G. J. Nicholson, Inland Lime & Stone Co., Manistique, Mich.

Ray C. Noll, Whiterock Quarries, Bellefonte, Pa.

Donald O'Connor, Rockland & Rockport Lime Corp., New York, N. Y.

I. A. Ogden, Dittlinger Lime Co., New Braunfels, Tex.

T. L. Pankey, Marble Cliff Quarries Co., Columbus, O.

R. S. Peotter, Marblehead Lime Co., Milwaukee, Wis.

E. C. Powers, Marble Cliff Quarries, Columbus, O.

G. J. Purnell, American Lime & Stone Co., Bellefonte, Pa.

Russell Rarey, Marble Cliff Quarries Co., Columbus, O.

N. C. Rockwood, *Rock Products*, Chicago, Ill.

Miss E. H. Roth, Sheboygan Lime Works, Sheboygan, Wis.

C. G. Ruedebusch, Mayville White Lime Works, Mayville, Wis.

C. H. Ruedebusch, Mayville White Lime Works, Mayville, Wis.

K. C. Ruedebusch, Mayville White Lime Works, Mayville, Wis.

W. H. Sallwasser, Wheeling Mold & Foundry Co., Wheeling, W. Va.

F. W. Sargent, President, C. & N. W. Ry., Chicago, Ill.

S. W. Stauffer, J. E. Baker Co., York, Pa.

W. J. Stewart, Marblehead Lime Co., Chicago, Ill.

Paul Sunderland, Ash Grove Lime & Portland Cement Co., Springfield, Mo.

W. A. Titus, Standard Lime & Stone Co., Fond du Lac, Wis.

E. E. Tratman, *Engineering News Record*, Chicago, Ill.

H. L. Vernia, Hoosier Lime Co., Salem, Ind.

G. T. Weigart, Batesville White Lime Co., Batesville, Ark.

G. J. Whelan, Kelley Island Lime & Transport Co., Cleveland, O.

B. B. Williams, Western Lime & Cement Co., Milwaukee, Wis.

Gordon Willis, Hunkins-Willis Lime & Cement Co., Peerless White Lime Co., St. Louis, Mo.

R. P. Wilton, Steacy & Wilton Co., Wrightsville, Pa.

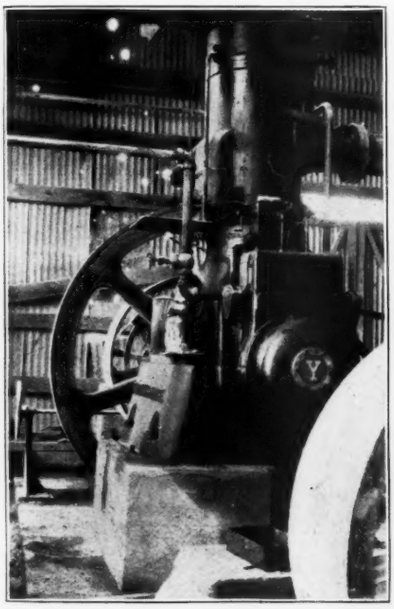
Geo. B. Wood, Rockland & Rockport Lime Corp., Rockland, Me.

Limestone Road-Base Materials Produced at This Plant in Arkansas

Vertical-Kiln Portland-Cement Plant Started Operations on Site in 1896

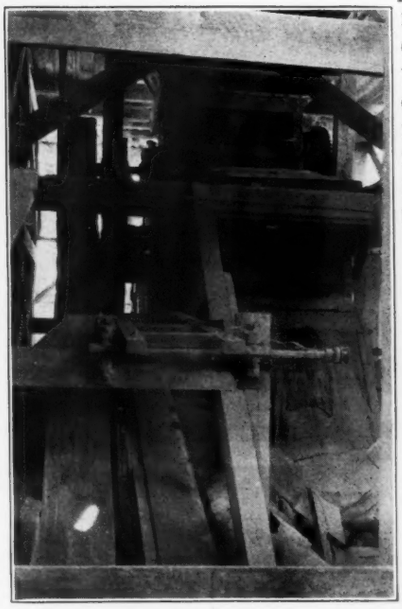
By W. E. TRAUFFER

THE plant of the Arkansas Lime Products Co., at Whitecliffs, Ark., is located on the Little River about 9 miles east of Ashdown and 40 miles northeast of Texarkana. The company owns 2,600 acres of land, about one-third of which is limerock containing an average of 90-per cent calcium. The deposit is part of the Austin chalk, known locally as Annona chalk, and is one of the few outcroppings in the state of Arkansas so located that they can be worked economically.



Diesel engine driving packers and conveyors.

The site of this plant has a rather interesting history. The quarry was first operated in 1896 when vertical kilns were erected for the manufacture of cement. This operation changed hands several times until 1904 when it burned to the ground. Then a plant was built for the production of agricultural limestone, asphalt filler, and whiting. This was rebuilt and sold several times until, in April, 1928, it was taken over by the Arkansas Lime Products Co. The entire operation was then rebuilt and a new road-material plant erected. In 1929, 125,000 tons were produced. The plant has a daily capacity of 1,250 tons of road material, 300 tons of agricultural limestone, and 150 tons of whiting and asphalt filler. The company has furnished materials for roads in Arkansas, Louisiana, Texas, and Illinois.

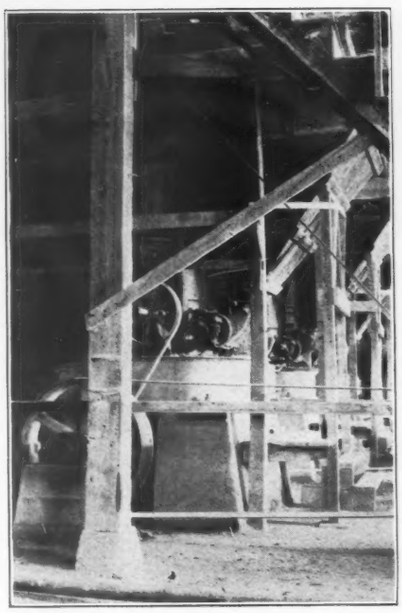


Single-roll primary crusher above hammer-mill.

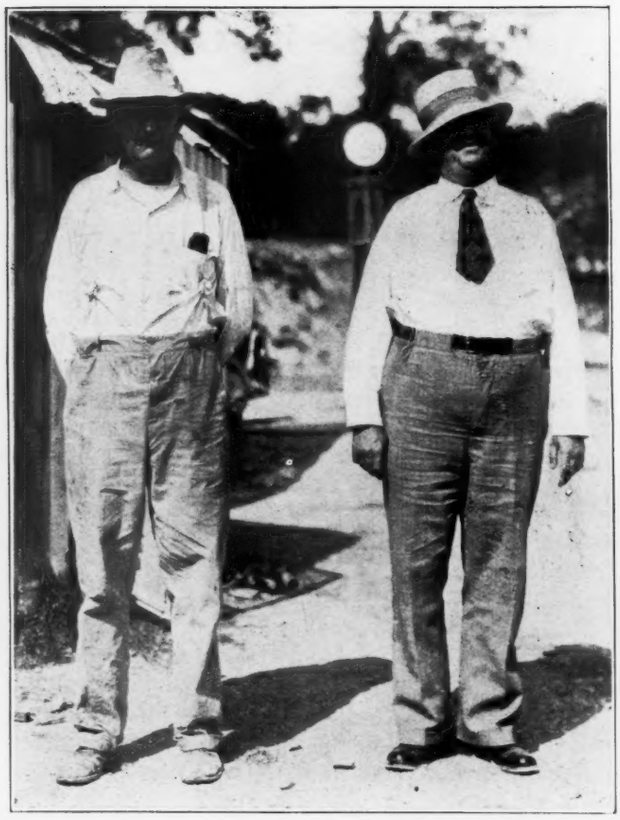
The deposit is of unknown depth with very light overburden. The rock is of medium hardness and in massive formation, with no seams and few cracks. Drilling is done by a Loomis Clipper 5-in. gasoline well drill. Bank shots of 20 to 30 holes are made on the 55-ft. face, using du Pont gelatin dynamite and plain Cordeau-Bickford safety fuse. Each shot moves from 6,000 to 10,000 tons of rock. Secondary drilling is done with Ingersoll-Rand Jackhamers, and a paving breaker of the same make is used for the smaller rock.

A Bucyrus-Erie D2 1-cu.yd. steam shovel loads the broken stone to two 1½-cu.yd. Ocala Iron Works end-dump cars. These are hauled up a double-track incline to the plant by two Ocala friction-drum hoists and dumped into the 24-in. by 56-in. Ocala steel single-roll primary crusher.

A 30-in. belt feeder on 12-ft. centers discharges into the Williams Jumbo No. 4 swing-hammer pulverizer which reduces the material to sizes ranging from ½-in. down to dust. An 18-in. belt conveyor can discharge this product directly into railroad cars for shipment as road-stone or carry the material a distance of 200 ft. to the finish grinding plant where it is made into agricultural limestone, whiting or asphalt filler. The entire crushing plant is driven, by belt from a line-shaft, by a 200-hp. Allis-Chalmers motor



Roller mills. Rotary Dryer in background.



W. T. Godwin, supt., and J. L. Godwin, gen. supt.

through Texrope drive. An auxiliary steam engine can be used in an emergency.

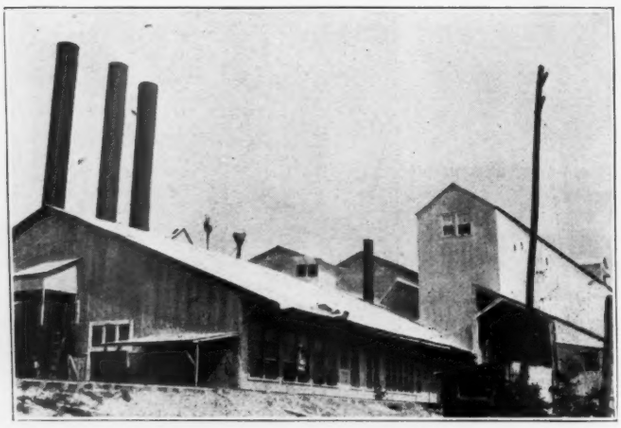
The conveyor from the crushing plant discharges to three wooden storage bins of 500-ton capacity. Three 18-in. belt conveyors on 175-ft. centers recover the material from the bins. When agricultural lime is desired, these feed to a Williams Jumbo No. 1 hammermill which reduces to 60-mesh. A short 18-in. belt conveyor feeds a Link-Belt portable loader which loads directly into boxcars.

For asphalt filler and whiting, the same three conveyors discharge into an 8-ft. by 80-ft. Allis-Chalmers fuel-oil-fired rotary dryer fitted with Gem gravity-feed burners. Forced draft is furnished by an American Blower Co. centrifugal fan. A bucket elevator takes the dried material to a storage bin from which it is fed to three Raymond roller mills. Each of these is equipped with a Raymond dust-collector and a 16-in. centrifugal fan.

An 18-in. belt conveyor feeds the finished product to storage bins with a total capacity of 3,000 tons. Another conveyor feeds from these bins to small bins over the two Howe sackers which pack the material into 100-lb. bags for asphalt filler and whiting. The sacking room has storage capacity for 10 carloads. The second floor of this building houses a fully-equipped bag-repair shop.

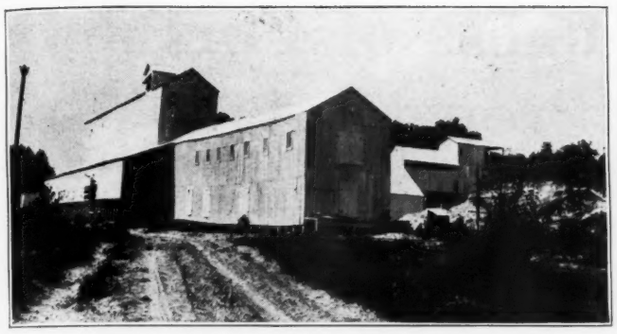
View of quarry and deposit from the crushing plant.

A few changes will be made soon to increase the capacity of the road-material plant. A new Williams No. 3 hammermill and two Link-Belt single-deck 4-ft. by 8-ft. vibrating screens will be installed. These units will permit road material to be reduced to 60-mesh for road stabilizer for use



Power house. Storage building at right.

Shovel in the quarry. Well drill above.

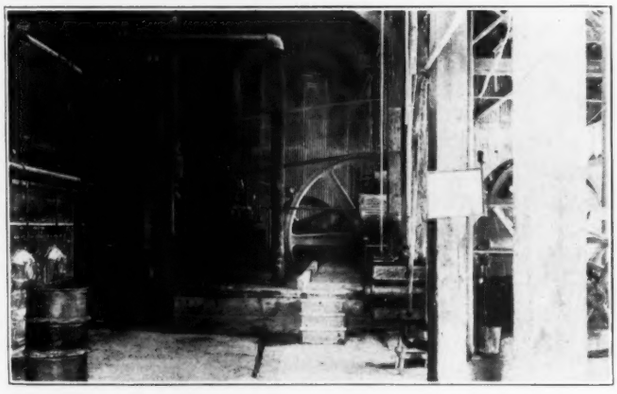


General view of plant from the south.

Water tank and superintendent's living quarters.

with gravel as a base. A new 10,000-ton storage bin will also be built for this material which is rapidly gaining in popularity in this section. The bins will discharge onto a belt conveyor in a concrete tunnel and thence directly into cars for shipment.

The power house is adjacent to the pulverizing and packing buildings. Three Oil City Boiler Works Geary oil-fired, 200-hp. watertube boilers furnish power for this part of the plant. They are equipped with a Cochrane feed-water heater and Gem gravity-feed burners. A 300-hp. Allis-Chalmers Corliss engine drives a 180-ft. line-shaft from which the pulverizer, mills, dryer, and some

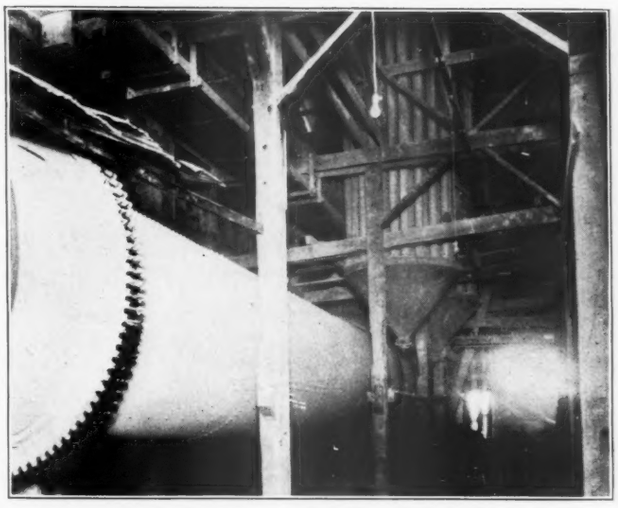


View of the engine room.

of the conveyors are driven by belts through individual clutches. A one-cylinder Fairbanks-Morse Diesel engine drives a short line-shaft from which the sackers and loading belts are driven. All conveyors, drive pulleys, and clutches were furnished by the Webster Mfg. Co.

A Skinner high-speed steam engine drives a Crocker-Wheeler 150-kva. generator which furnishes current for small motors and lights. Compressed air for the jackhammers and other purposes is furnished by a Laidlaw, Dunn, Gordon Co. 500 cu. ft. per min. double-compound, steam-driven air compressor and an Ingersoll-Rand automatically controlled compressor, with a capacity of 125 cu. ft. per min., driven by an electric motor of the same make. Square D safety switches are used throughout.

Fuel-oil for the dryer and boilers is stored in five 12,000-gal.-capacity steel tanks on the bank of the river near the plant. Water for plant operation is furnished by an Allis-Chalmers 100-g.p.m. centrifugal pump driven by an electric motor and a 6-in. Duplex-Knowles steam-driven pump. These pump



Rotary dryer. Dust collectors at right.

to a 40,000-gal. tank on a hill above the plant.

The plant has a well-equipped blacksmith and repair shop containing, among other equipment, an Oxweld acetylene set. There is also a storeroom with a complete set of small parts, a grocery store and filling station, and post-office. The employees live in the village of Whitecliffs on the hill

(*Continued on page 48*)

Physical laboratory. Chemical laboratory is seen through door.

Influence of the Fineness of Portland Cement on Its Properties*

By DR. P. FILOSSOFOW

IN VIEW of the fact that the fineness of grinding of Portland cement is a matter in which the cement industry is particularly interested at all times, it is considered advisable to give below an account of the work done in the laboratories of the Technical High School in Moscow, U. S. S. R., on this particular subject, in the effort to gain additional knowledge on the importance of the size of the particles of cement. The Portland cement used in these experiments was of the following analysis: Silica, 20.80 per cent; alumina and iron oxide, 9.89 per cent; lime, 64.40 per cent; magnesia, 0.96 per cent; and alkalies, 2.76 per cent. When the mortar was made of neat cement the amount of water used was 25 per cent, and when made with sand in the ratio of 1:3, the amount of water was 8.5 per cent. The fineness of the cement was as follows:

Residue on 900-mesh screen.....	2.0 per cent
Residue on 4,900-mesh screen.....	11.0 per cent
Material passing through 4,900-mesh screen	87.0 per cent

Tests made on the constancy of the volume of the cement-test samples showed that these samples retained their volume.

The mechanical-strength tests made on the cement samples gave the following results:

	After 7 days (Kg. per sq. cm.)	After 28 days (Kg. per sq. cm.)
Tensile strength of neat cement...	42.1	67.4
Tensile strength of 1:3 cement-sand mortar	22.3	29.0
Compressive strength of the mixture 1:3.....	...	235.2

The cement was divided into two parts by means of a 10,000-mesh screen. The first was the coarse fraction *G*, representing the residue on the 10,000-mesh screen, and the second fraction was composed of the fines *F* which passed through the screen.

The following mixtures were then made from these two fractions:

1. Consisting of 100 per cent of fraction *F*, 0 percent of fraction *G*.
2. Consisting of 90 per cent of fraction *F*, 10 per cent of fraction *G*.
3. Consisting of 70 per cent of fraction *F*, 30 per cent of fraction *G*.
4. Consisting of 50 per cent of fraction *F*, 50 per cent of fraction *G*.
5. Consisting of 30 per cent of fraction *F*, 70 per cent of fraction *G*.
6. Consisting of 10 per cent of fraction *F*, 90 per cent of fraction *G*.
7. Consisting of 0 per cent of fraction *F*, 100 per cent of fraction *G*.

In order to determine as well the influence of the size of the particles of the cement on the hardening process, a mixture, No. 8, was also prepared, which consisted of the residues retained by a 4,900-mesh screen.

Tests were accordingly carried out with the aid of these mixtures to determine the time of setting and the tensile strength, both of the neat cement as well as of cement-sand mortars made in the ratio of 1:3. The tensile-strength tests were carried out after 7, 28 and 180 days of storage of the samples under water. Furthermore, certain samples of mortar in the proportion of 1:3 were tested for strength in compression after 28 days storage under water.

The results of these tests were as follows:

	No. 1	No. 2	No. 3	No. 4
In hours	9.30	9.45	10.30	11.50
	No. 5	**No. 6**	**No. 7**	**No. 8**
In hours	12.00	14.00	19.00	26.00

The above figures give the time of setting of the cement mixtures in hours. Fig. 1 shows these results in graphic form. It is easy to see just how the time of setting increases as the particles of the cement become larger.

The strength tests are given in Table I for different periods of storage under water. Pure cements only were tested in this experiment and the tensile strength of the cement is given in kilograms per square centimeter.

Figs. 2 and 3 show these results in graphic form. An analysis of these results reveals some interesting facts.

In the first place, it is seen that the cement which contained the finest particles gave the highest tensile strength at the beginning, that is, after 7 days. However, the strength of this cement was reduced considerably as the hardening process pro-

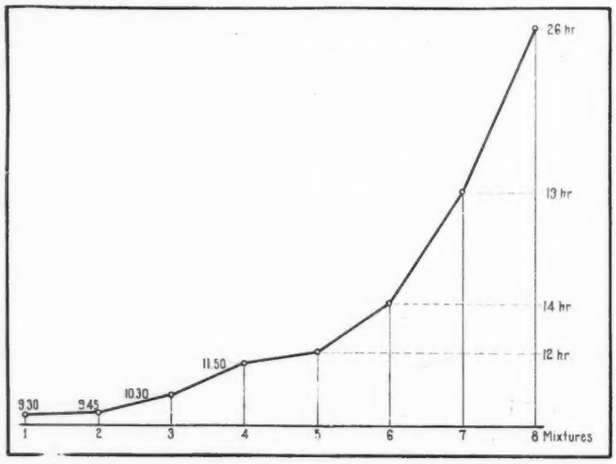


Fig. 1. Time of setting of cements under test.

* Translated from *Tonindustrie Zeitung*, 1929 (1302-4).

TABLE I—TENSILE STRENGTHS (*Kg. per sq. cm.*)

Mixture	(Duration of Storage Under Water)			
	7 days	28 days	90 days	180 days
No. 1	61.1	65.0	60.2	56.0
No. 2	54.0	63.5	56.1	57.2
No. 3	43.2	69.2	70.0	70.0
No. 4	41.2	61.0	60.8	61.0
No. 5	36.3	55.3	57.1	58.2
No. 6	25.0	49.0	51.3	56.0
No. 7	23.0	47.1	46.6	53.0
No. 8	3.5	30.4	35.7	53.1

gressed. After 180 days of storage under water the tensile strength of this cement had decreased to such an extent that it was equal to that of the sample made from mixture No. 6, containing 90 per cent of coarse particles.

In the second place, the cement which contained the coarsest particles representing the residues on the 4,900-mesh screen, gave very inconsiderable tensile strength figures at the beginning of hardening. Nevertheless, the tensile strength of this cement gradually increased, and after 180 days of storage under water, the tensile strength of cement No. 8 was equivalent to that of No. 7, and was not appreciably different from the tensile strength of the cement which contained the finest particles.

In the third place, cement mixture No. 3, consisting of 30 per cent coarse particles and 70 per cent of fine particles, gave the highest tensile strength figures after remaining under water for twenty-eight days.

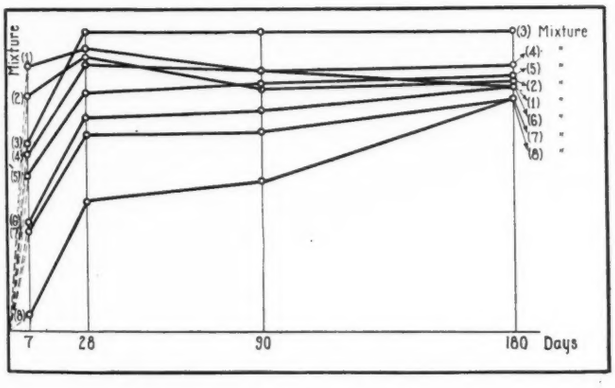


Fig. 2. Tensile strengths of cements.

Fig. 3 is interesting in that it shows how the tensile strengths of the different mixtures vary at like durations of hardening. It is easily seen from these curves that the tensile-strength figures of the cements, containing the smallest to the largest particles, drop markedly at the 7-day storage period, the decrease being regular from the finest to the coarsest cement. On the other hand the extent to which the cements differ from one another gradually decreases as the time of hardening increases, until they are practically uniform at the end of the 180-day period. The only difference lies in the transition from cement mixture No. 2 to cement mixture No. 3, and from No. 3 to No. 4.

The tensile strengths of samples which were made from various cement mixtures in the proportion of 1:3 are shown in Fig. 4.

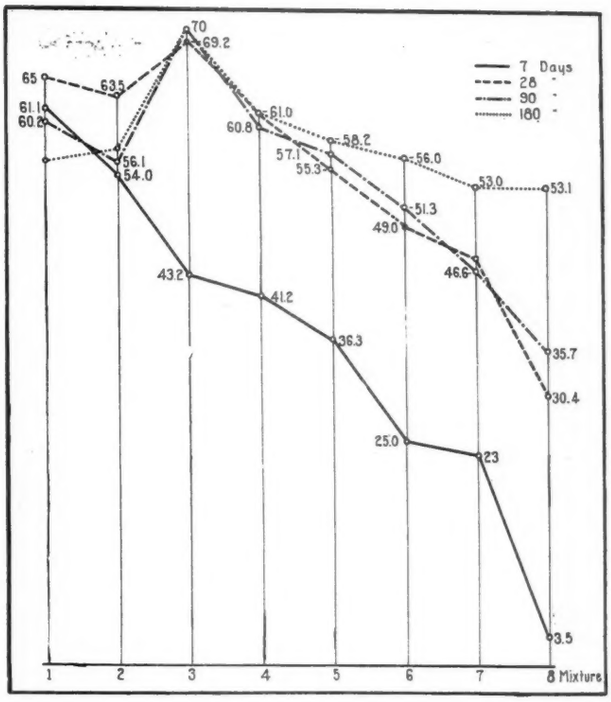


Fig. 3. Strength variations at different periods of curing.

The results obtained from the tests showed that, as the tensile strengths of the mixtures of cement mortar and sand increases, the finer are the particles of the cement. No marked deviations were observed in this connection, however. In contradiction to the tests which were made on the neat-cement mixtures, the cement which contained the finest particles gave the highest tensile-strength figures.

The changes in the tensile strength of the 1:3 cement-sand mixtures, as the size of the particles of cement varied while the duration of hardening remained constant, are shown in Fig. 5, so that a comparison may be made in this connection with the curves drawn for neat-cement mixtures.

The curves of Fig. 5 indicate that, in comparison with the neat-cement results, a uniform change in the tensile strength takes place on transition from one particle size to the other, and the rate at which this change takes place is also quite uniform for different periods of curing.

Cubes were prepared from mixtures of three parts of sand and one part of cements Nos. 1, 3, 5 and 7. These were kept under water for 28 days and then tested for their strength in compression. The results in kg. per sq. cm. were:

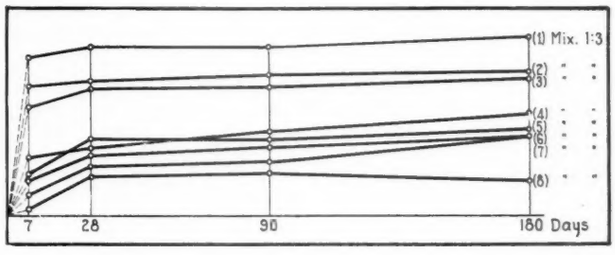


Fig. 4. Test results of cement-sand mortars.

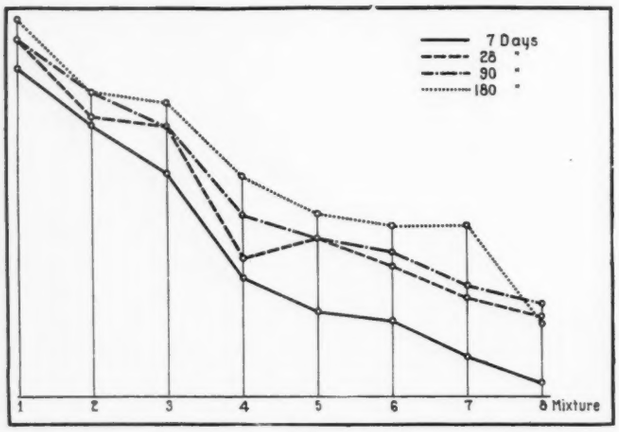


Fig. 5. Strength variations for cements of different-sized particles.

Cement mixture No. 1	425.6
Cement mixture No. 3	225.3
Cement mixture No. 5	202.3
Cement mixture No. 7	125.1

It can be seen from this tabulation, and also from Fig. 6, that the strength of the cements in compression decreases as the size of the particles increase.

The four general conclusions which have been drawn from this research are as follows:

1. When the cement is used alone, that is, without the admixture of sand, too great a fineness of particles can cause a reduction in the tensile strength of the cement. This, therefore, means that the finest grinding of the cement does not give a product with the highest tensile strength.

2. The coarse cement that is obtained as a residue on the 4,900-mesh screen shows only a slight degree of activity, that is, as far as hardening and gaining strength are concerned, merely at the beginning of the hardening process. However, as the hardening process progresses, it is found that this cement possesses a tendency to increase in activity and finally it attains a tensile strength which compares with that of the finest-ground cement.

3. The most favorable condition of fineness is attained with a cement, of which 70 per cent passes through a 10,000-mesh screen. This pertains to the tensile strength of the neat-cement mixture.

4. The strength of the mortar which contains one part of cement and three parts of sand (and this refers both to strength in compression as well as tensile strength) increases in complete and regular relation to the increase of the fineness of the cement particles. This refers to hardening periods up to the maximum of six months.

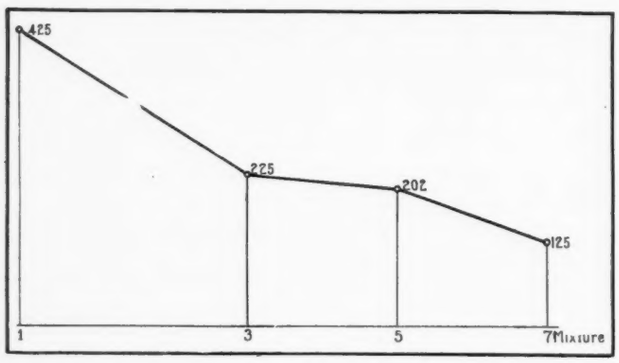


Fig. 6. Test results of four cements of variable fineness.

Limestone Road-Base Materials

(*Continued from page 45*)

above the plant. There are 14 company-owned houses for the employees, and more pretentious houses for the superintendent and chief engineer. These are steam-heated and have all of the modern conveniences, such as running water and electric lights. W. T. Godwin is plant superintendent.

The plant is connected by a ¾-mile sidetrack with the Graysonia, Nashville and Ashdown Ry., a 29-mile railroad which connects with the Missouri Pacific Ry. at Hope and the Kansas City Southern and Frisco Railways at Ashdown. The only damage done to the plant by the unprecedented floods in the middle of May this year was the washing out of a short piece of the siding to the plant.

Officers and personnel of the Arkansas Lime Products Co. are: J. C. Corcoran, chairman of the board of directors; A. M. Lewis, president; J. A. Cormiere, vice-president and general manager; D. A. Moylan, secretary and treasurer; G. E. Moore, resident vice-president and local manager; John Lowden, vice-president; J. L. Godwin, general superintendent; and L. F. Fernold, chief chemist. Offices are in the State National Bank Bldg., Texarkana, Ark. This company is a subsidiary of the Marianna Lime Products Co. of Marianna, Fla.

All chemical and physical testing for this plant and the plant at Marianna is done in the laboratories at the offices in Texarkana. These laboratories are equipped to do analytical and research work of any nature. Equipment consists of a Tyler Ro-Tap sieve shaker, a Fred S. Carver 25,000-lb.-capacity hydraulic compression testing machine and other equipment.

The main product of the plant is road material of which two types are produced. These are the crusher run, from ¾-in. down, which is used as a base material exclusively, and the 20-mesh-and-under material for the increased production of which the new machinery is being installed.

The road material has a cementation value of as high as 750 and an abrasive resistance that is minus. In spite of the latter, however, when compacted with heavy rollers it becomes very firm and readily receives and holds asphaltic treatment. It is used for base material only.

The 20-mesh-and-under stabilizer material is used for a type of road that is rapidly becoming popular in this section. Old macadam and gravel roads which have been broken down by heavy traffic are salvaged by scarifying into them some of the stabilizer. When properly wetted and rolled, this type of road sets quite hard and firm and forms a dense, rigid and compact base. This base will hold a wearing surface and insure against the rutting found in loose bases.

Effect of Soft Aggregates on Durability and Strength of Concrete

By W. J. EMMONS
Director, Michigan State Highway Laboratory, Ann Arbor, Mich.

VIRTUALLY all of the gravel aggregate used in state highway work in Michigan contains more or less of certain types of stone which specifications designate as soft and non-durable particles. Among these are certain varieties of sandstone, shale, ochre, and a curious light-weight porous, fossiliferous, dolomitic material, colloquially known as "floaters." All of these types are soft, some more so than others. Ochre and loosely bonded sandstone can often be broken with the fingers. Some are structurally unsound, such as shale which disintegrates when exposed to the air, and all absorb large quantities of water.

The specifications set up certain requirements for gravel coarse aggregate which limit the quantity of these materials which it may contain. These percentages are arbitrarily chosen, being based on judgment and experience. It is obvious that these types of stone are undesirable, but their actual effect upon the strength and durability of concrete has never been carefully determined.

During the construction season of 1928, it was decided to undertake such an investigation. Inspectors at the several gravel pits were instructed to collect large quantities of the materials in question, and to forward them to the laboratory. At the close of the construction season, laboratory work was started and the several materials were separated as accurately as possible in accordance with the following classification:

(1) Sandstone (hard absorbent); (2) sandstone (intermediate, or borderline); (3) sandstone (soft); (4) shale; (5) ochre; (6) floaters.

The three classes of sandstone are rather arbitrarily defined upon the basis of the bond which exists between the sand particles composing them. The customary laboratory tests were made upon all of the types, the abrasion test being the usual modified form employed for gravel.

Every possible precaution was taken to eliminate variables in the preparation of the concrete. The coarse aggregate was hand picked to remove soft particles, and was also screened into five sizes for recombination as the batches were proportioned. In order to prevent absorption of mixing water, it was stored in a damp condition.

The concrete was designed by the mortar-voids theory to give maximum strength at workable consistency with 1.5 bbl. of cement per cu. yd. Each batch was sufficient to make two 6 in. by 6 in. by 36 in. beams and three 6 in. by 12 in. cylinders. Flow tests were made as a measure of plasticity, and varied from 130 to 165, with an average of about 150, except for the mixture containing the maximum percentage of soft sandstone. In this case, the flow was 120, probably due to the breaking down of the loosely-bonded soft particles. Otherwise, there were but slight indications that either disintegration or absorption affected the consistency.

For each type of soft stone, a complete set of specimens was composed of two beams and three cylinders, each group containing coarse aggregate carrying 2, 3, 5, 7, 10 and 15 per cent respectively of the material being investigated. These percentages were by weight, and as the specific gravities of the soft materials varied considerably, the volumetric percentages were variable. In addition to those containing soft stone, two groups of two beams and three cylinders each, containing no soft stone, were made for purpose of comparison. These were called control specimens. Thus, for all six types of soft stone, there were made 96 beams and 144 cylinders.

The entire program was carried out three times, giving three complete series of specimens as described in the preceding paragraph. One series was broken after normal moist air curing for 28 days; the second series was frozen and thawed 25 times after 28 days of normal moist air curing and the third series is still being held for longer time tests.

Tests on Series 1

At the expiration of the 28-day moist-air curing period, an entire series of specimens was tested. The cylinders were broken in compression. The beams were tested as cantilevers, each being sufficiently long to provide two tests.

When the results from the beam tests were reviewed and platted with relation to the soft stone which it was known that the concrete contained, the data appeared quite erratic. Assuming that the soft stone was effective in decreasing the strength of the concrete, this result might have been anticipated, for, although it was definitely known that certain percentages of the soft stone were contained in the specimens, there could be no assurance that the particles would be uniformly distributed. Moreover, if the soft stones were harmful, it would be increasingly so as particles of it were placed nearer the surface which was subjected to maximum tension in the cantilever test.

Fig. 1 shows a beam section containing a soft particle of aggregate. If the beam is bent downward, placing the upper side in tension and the under side in compression, there is no stress at the neutral axis. If the soft stone carries, or is assumed to be capable of carrying no tension, it

*Abstracted from a paper presented at the Sixteenth Annual Conference on Highway Engineering, University of Michigan, Ann Arbor, Mich., February 12, 1930.

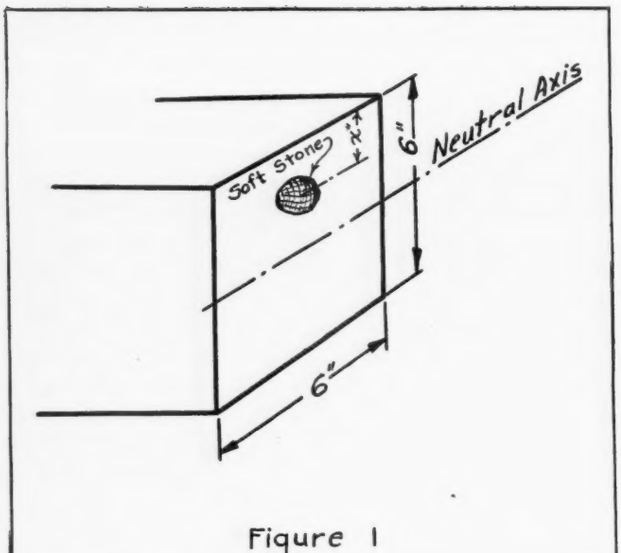


Figure 1

is the same as a void, and may be regarded as reducing the section modulus. If the section were composed entirely of soft stone, under this assumption, the section modulus would be zero, and it could carry no load. Any intermediate percentage of reduction would proportionally reduce the stress resisting capacity of the section. Knowing then, the strength of beams containing all sound aggregate, and the percentage reduction in section modulus due to the presence of certain soft stones in the area of the fracture, it is possible to determine whether or not the soft stone carries stress, or, in other words, whether it is better or worse than a void.

All broken beams were, therefore, carefully examined and the size and location of soft stone recorded as accurately as possible. The approximate reductions in section moduli were then determined and plotted against the maximum bending moments which resulted in rupture. . . .

Tests on Series II

Subsequent to 28 days of moist-air curing, the second series of specimens was subjected to 25 alternations of freezing and thawing. Upon completion of this treatment, those specimens which had not failed were tested for strength. . . .

Several factors influenced the results of the freezing and thawing series. The first was the presence of chert, a certain amount of which was contained in the so-called sound coarse aggregate to which the softer particles were added. Chert is a hard, dense, silicious rock showing a loss in the gravel abrasion test of only 4.3 per cent. Most of the chert particles contain minute fissures which account for its high absorption of about 5 per cent. When wet and frozen the contained water cannot expand except by rupturing the rock particle with corresponding damage to the concrete. A considerable number of specimens were lost, as far as strength tests were concerned, by this behavior of chert.

Freezing and thawing seemed to decrease the bond strength in some cases between mortar and sound coarse aggregate. A tendency was noted in some instances for trap and quartzite particles to pull away from the mortar in the beam tests.

Evidence that freezing and thawing had caused expansion and contraction of the soft stones and weakened the surrounding mortar, was not wanting. Beams containing ochre were of much less strength after this treatment, and to this section is attributed the many irregular curves based upon reduction in section moduli. Similar effects were evident in connection with the compression tests but the most damaging material in this case appeared to be the soft sandstone.

A comparison of the strengths of the control specimens of the two series presented a puzzling development. The beams of the freezing and thawing group showed a strength uniformly lower by 8 per cent than those subjected to normal 28-day curing. The compression cylinders, on the other hand, were stronger by an average of 26 per cent after being subjected to the freezing and thawing tests. . . .

The chief object of the freezing and thawing series was to determine how these several types of stone might be expected to affect the durability of concrete.

As the work progressed the beams and cylinders were examined and progressive failures noted. Upon completion of the strength tests, each specimen was examined and, where necessary, the concrete was broken to disclose the cause of the trouble.

Three general types of deterioration were noted and classified as pits, spalls, and fractures. A pit is caused by the expansion in freezing of a stone near the surface which broke away the concrete over an area but slightly larger than that of the stone. A break, considerably larger in size than the stones which caused it, is called a spall.

Frequently, in the cases of spalls and fractures, chert was found to be associated with the other types of questionable material and responsibility for the failure could not be definitely placed. In all cases, therefore, the number of particles of each

Pits and spalls in tests cylinders caused by the border line type of sandstone.

type appearing in any break was listed. Thus 3 pieces of soft sandstone and 1 piece of chert on the face of a fracture would all be listed.

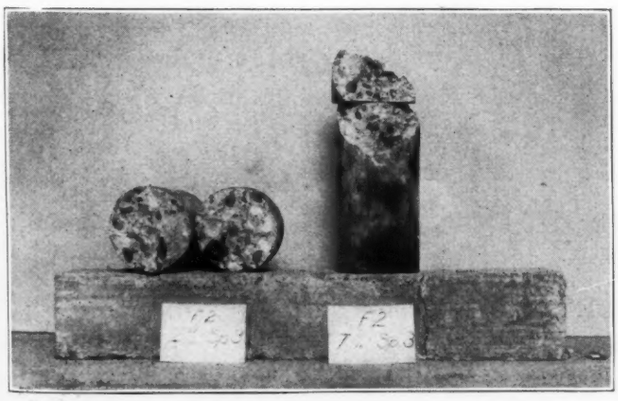
It seems apparent that the type of failure (pit, spall or fracture) will depend largely upon the depth in the concrete from which the stone will break out and is, therefore, an indication of its destructive nature. Pits, although undesirable, are not as serious as spalls and the damage from the latter is not as great as from fractures. An arbitrary value of 1, 2 and 3 was assigned respectively to pits, spalls and fractures and a rough rating computed.

Although each type of soft stone appeared in only a single set with the exception of a few chance pieces, chert was present in all of the coarse aggregate. The average percentage of the soft stone in the coarse aggregates was 5.35 per cent, whereas chert was present only to the extent of 1.23 per cent. In order to obtain a comparable rating for chert it was therefore necessary to multiply its rating per set by $\frac{5.25}{1.23}$ of 4.27.

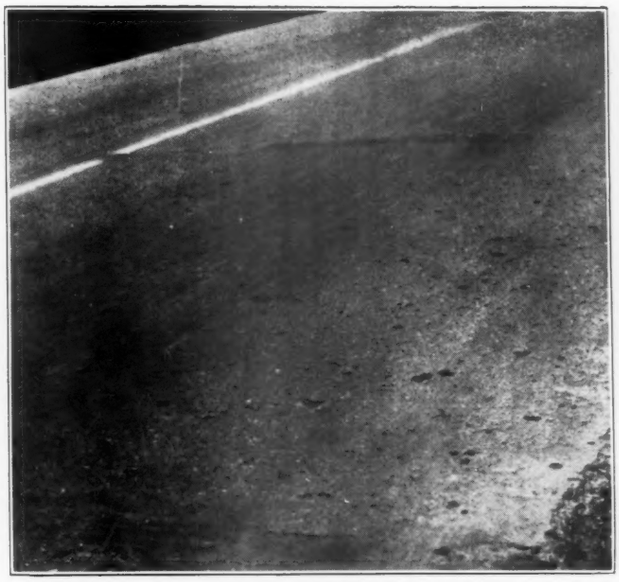
SUMMARY OF RESULTS OF FREEZING AND THAWING TESTS

Class of Stone	Number of Pieces Appearing in Deterioration				
	Pits	Spalls	Fractures	Rating	Percent Appearing
Hard, absorbent sandstone	7	1	.....	9	0.2
Borderline sandstone	25	8	18	93	2.5
Soft sandstone	35	28	22	157	4.2
Shale	2	.....	.....	2	0.1
Ochre	65	17	29	186	5.0
Floaters	.....	1	4	14	0.4
Chert (*ave. for series*)	.....	.....	.....	226	6.1

The final column of the accompanying table is a rough estimate of the percentages of the several classes of stones which appeared in some form of failure. This is based upon the amounts which the coarse aggregates were known to contain. Since it was impossible to determine the size of the particles these percentages must be regarded merely as an approximation.



Cylinders fractured in freezing and thawing tests. Failures due to chert.



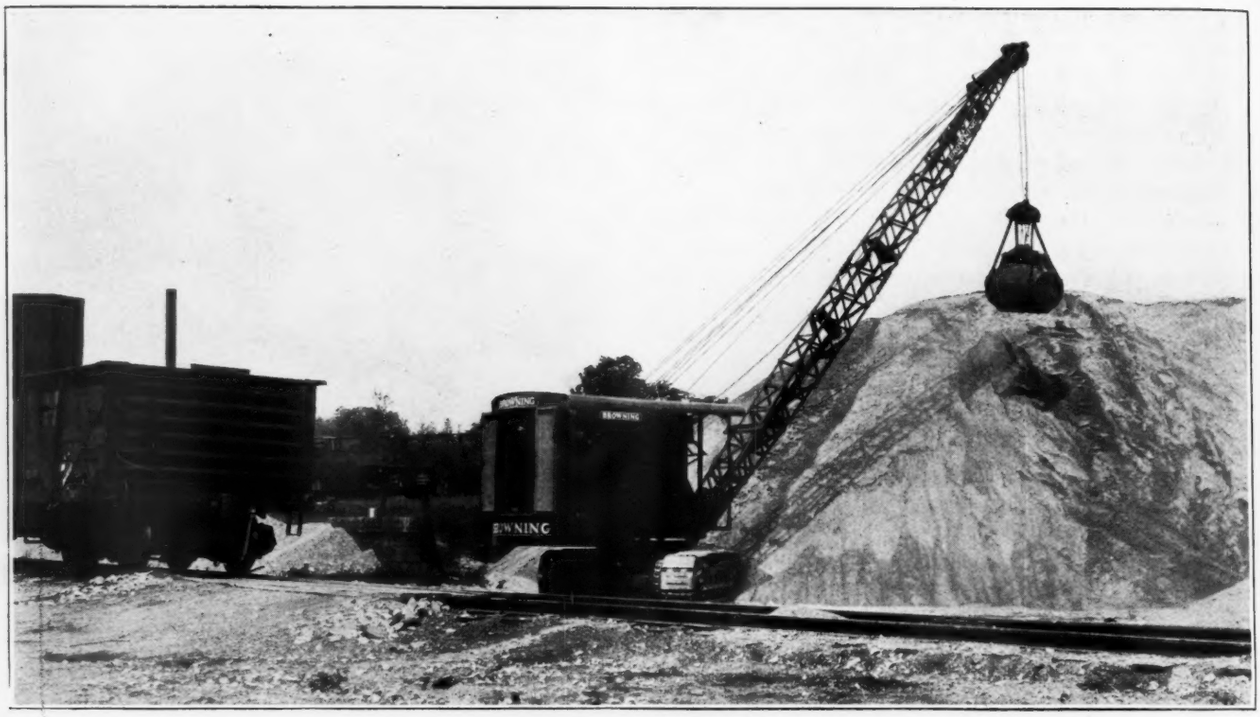
Pits in concrete pavement due to the presence of soft stone in the coarse aggregate.

It is felt that the table gives a fairly true measure of the results of the freezing and thawing series, except that the destructive tendencies of chert can hardly be over-emphasized. In the majority of fractures, chert was associated with the type of soft stone under investigation in that particular set. Full responsibility for these failures cannot be charged to chert, however, for with certain types, hard absorbent sandstone, shale, and floaters to be specific, which were found in few fractures, the action of chert was far less noticeable. It is more likely that the tendency of the softer sandstones and ochre to rupture the concrete was merely accentuated by the presence of chert.

There can be little doubt that the presence in concrete aggregates of the materials studied is injurious. The normal strength of the concrete is reduced and the liability of deterioration under freezing and thawing conditions is greatly increased.

Much of the effect of these materials upon both strength and durability is dependent upon the location of the particles in the structure, and neither in the laboratory nor in the field can this factor be controlled. A far more extensive investigation, involving concretes of different proportions, and exposure under many conditions would be necessary to determine, within a reasonable range of accuracy, quantitative measures of these effects under service conditions. That such an extended study would be worth while, is doubtful, for the several general types of the undesirable materials are themselves of rather indefinite and variable classification, and not susceptible to accurate definition.

In areas where such soft and structurally unsound materials occur, however, this investigation does unmistakably point to the desirability of reducing, to the economic minimum, their percentages in coarse aggregate.



Gasoline crane with ¾-cu. yd. clamshell bucket handling material from stockpile to cars.

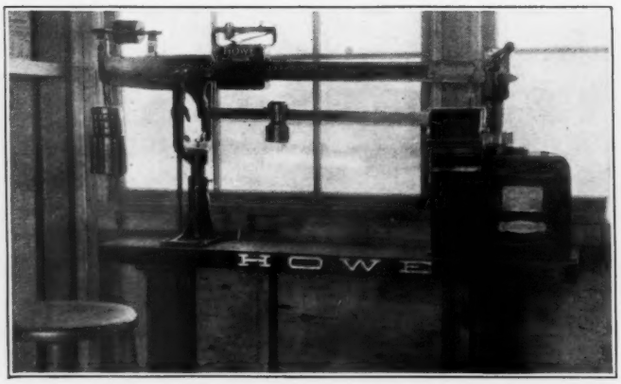
Sand-Dredging and Distributing Plant Begins Operating at St. Louis

THE American Sand and Material Co. of St. Louis, Mo., on March 8 of this year, put into operation a new sand-dredging and distributing plant. It is a simple and economical plant and will turn out about 300 tons per hour. It is located at the foot of Quincy St., on the Mississippi River.

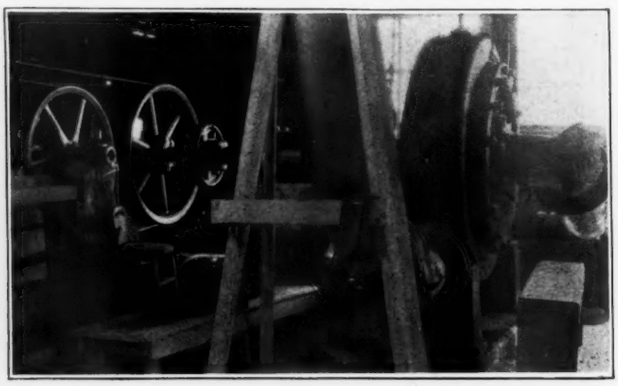
The dredge is of timber construction with a hull 105 ft. long by 28 ft. wide and 4 ft. deep. A 10-in. Worthington dredge pump with an intake 50 ft. long is used. The discharge line goes through the top of the dredge to a steel chute feeding the barges. This chute has a perforated bottom which can be changed as desired to waste any size.

A 180-hp. hand-fired, return-tubular boiler furnishes power for all operations. A 2-cyl. single-drum American hoist operates the nozzle which is supported from a stationary timber boom. A bull-wheel attached to this hoist handles barges alongside the dredge. A single-drum hoist of the same make handles the anchor which is necessary when dredging in the river. The boiler also furnishes steam for priming the pump. The pump is driven through a 4-strand manila-rope transmission line with a weighted take-up.

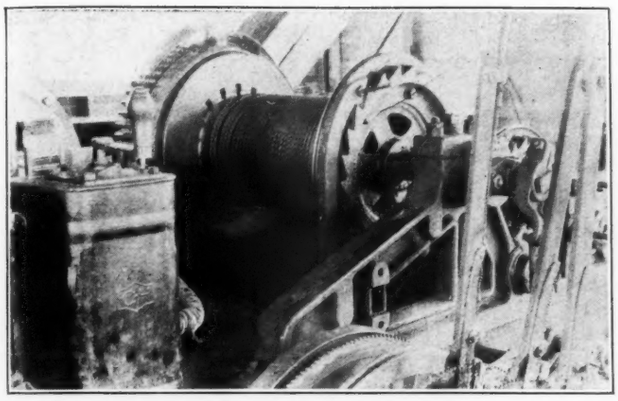
Operations are on the Mississippi River generally within 600 ft. of the shore plant. By moving around to various parts of the river any size of



Truck scale with weight-recording device.



Interior of dredge showing 10-in. centrifugal pump.

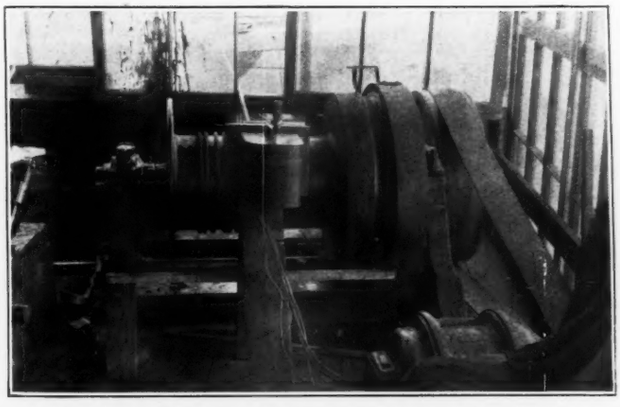


View of 3-drum hoist on the derrick.

sand desired can be obtained. Six 350-ton wooden barges and two Dravo steel barges are hauled by a 150-hp. steam tugboat.

The barges are unloaded at the shore plant by a timber stiff-leg derrick handling a 1-cu. yd. Owen clamshell bucket. A Clyde 3-drum hoist, chain-driven by a 40-hp. General Electric motor, operates the boom and bucket. A Reliance one-drum hoist, belt-driven by a 7½-hp. General Electric motor, swings the boom. The derrick is built partly over the bank of the river and is supported on timber piling.

The derrick discharges into a 30-ton-capacity wooden hopper. This feeds through quadrant gates to a 30-in. belt conveyor on 60-ft. centers discharging to the main distributing conveyor. This is also 30-in. wide and is on 280-ft. centers. About half of this conveyor is inclined to a height of 45 ft. The remainder is level and has metal-plate trippers which allow the material to be dis-



Single-drum hoist which swings boom on the derrick.

charged into any of three piles. This arrangement serves a storage space 200 ft. long.

The conveyors and gates were furnished by the General Conveyor and Manufacturing Co. They are driven by 12-hp. and 35-hp. motors, respectively. The steel framework supporting the conveyors has concrete footings.

Material is rehandled for shipment by a Browning Crane Co. type K gasoline crawler crane with a 40-ft. boom handling a ¾-cu. yd. Brownhoist clamshell bucket. Shipments are about equally divided between railroad and trucks. Most of the products is used for road work and plastering.

A neat wooden-frame office building houses a Howe truck scale with a Weightograph attachment. General Electric motors, Allen-Bradley push-button switches, Square D safety switches and Cutler-Hammer controllers are used throughout the plant. All wire rope is furnished by the A. Leschen & Sons Rope Co.

The main office of the company is at 3505 Gravois Road, St. Louis, Mo. Officers are: Chas. R. Reed, president; Joseph Hoffman, vice-president and plant superintendent; Leo H. Hummert, secretary and general manager; and Fred Lehmkuhl, treasurer.

Use of Lime in the Manufacture of Soap and Allied Products

In the manufacture of soap and allied industries, lime is used as a saponifying agent in the production of soap, fatty acids and similar products, and glycerin; as a precipitating agent in the purification of soap; as a neutralizing agent, where the lime is used to neutralize any sulphuric acid in the soap; and for causticising solutions of sodium or potassium carbonate in order to produce alkali.

In the ordinary way, soap is made by boiling oil or fat with caustic soda, which decomposes the oil into fatty acid and glycerin. Sufficient soda is used to combine with the fatty acid, forming the soap insoluble, so that it can be filtered off, leaving the water with glycerine in solution as a by-product.

As soda is expensive, many attempts have been made to replace it by lime. In that case, the first process is to form a lime-soap which, being insoluble, can easily be separated, purified (when low-priced oils are used), and then converted into a soda-soap by means of sodium carbonate. Under such conditions, the lime is merely employed to produce a soap of no commercial use, but convenient chemically as a cheap means of obtaining a substance which can be purified and, after all the impurities have been removed, can be converted into ordinary soap.

In the autoclave method of making soap, the previously-purified fat or oil is mixed with lime and water and is heated in an autoclave for several hours. This causes a splitting up of the fat into a lime-soap and glycerin.

The lime required is, theoretically, 8.7 per cent of the weight of the fat, but in practice, 2.4 per cent is sufficient.

The lime-soap is filtered off and mixed with sulphuric acid which converts it into calcium sulphate (gypsum) and a free fatty acid. The latter can then be mixed with a solution of sodium carbonate or caustic soda and converted into a soda-soap.

The gypsum produced by the sulphuric acid is insoluble in water and tends to block pipes, etc., so that magnesia or zinc oxide—which form a soluble sulphate—are sometimes preferred to lime.

The Development and Use of Alloy-Steel Castings in Modern Industry

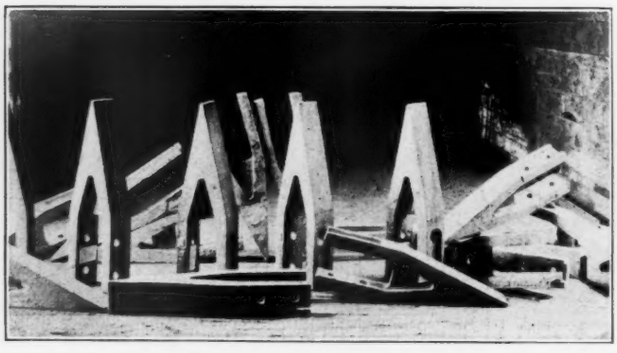
By H. D. PHILLIPS
Metallurgist, Empire Steel Castings, Inc., Reading, Pa.

IN ORDER to keep pace with the ever-increasing pressure that has been put upon iron and steel manufacturers to lower costs and better their products, the casting manufacturer has been watching with particular interest the recent developments by which better and cheaper castings can be produced and has, within the last few years, turned extensively to their manufacture. The price factor is perhaps not apparent in the purchase price but lies in the economic cost or costs in operation as compared to a plain carbon or inferior alloy-steel casting. It has not been much over 25 years since the first commercial alloy-steel castings were obtainable. The war, demanding the use of high-quality castings, increased tremendously the tonnage of alloy-steel castings used. It is, perhaps, needless to say that, at present, they are firmly established, each alloy or group filling a definite need and, due to this present tremendous use, it would be impossible to discuss, in any one limited paper, their uses or manufacture. This paper, therefore, is to be devoted to a discussion of chrome-molybdenum steel castings. For such castings recourse is had principally to chromium and molybdenum as the alloying elements, although nickel and, at times, vanadium are used.

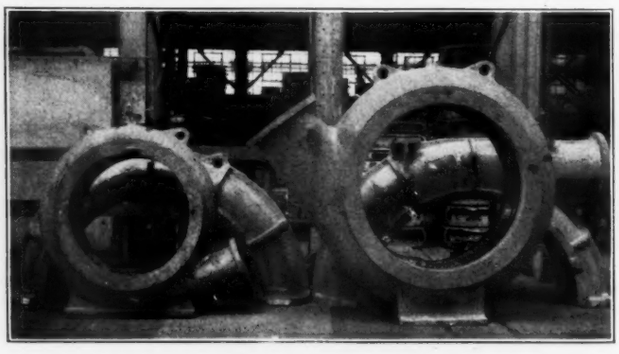
Let us, first, consider the properties imparted by these elements, chromium and molybdenum. Chromium exerts a powerful influence and brings about marked changes in the properties of the casting subject to heat treatment. It greatly increases hardness, due to the retarding effect of chromium on the decomposition on certain constituents, the complex carbides of iron and chromium during rapid cooling. It increases resistance to shock by retarding the tendency toward coarse crystallization, and imparts high tensile strength with great ductility. In addition, the presence of certain amounts of chromium in steel inhibits corrosion and oxidation. However, this latter property is not present in the lower chrome-steel series. Chromium can, indeed, be classed as a master metal.

The effect of molybdenum on steel is principally an extraordinary increase in the limits of elasticity in general with a higher tensile strength and good ductility. It forms carbides in the steel which are extremely resistant, particularly to the formation of cracks, this property being of interest to the foundryman. It imparts, like chromium, marked and valued air-hardening properties. It dissolves uniformly in the ferrite or pure iron constituent, tending also to prevent enlargement of grain size. The molybdenum imparting marked air-hardening properties, makes possible a slower cooling rate to produce certain strengths or hardness in the casting, thus reducing dangers attendant with the heat treating of large or intricate castings.

The combination of the properties imparted by these elements when both are present in the steel, makes possible a great diversification of uses to which this particular group or series of steels may be put and some of the good features of this combination of elements lies in the distinct saving of time achieved in the machining of these steels compared to that required for any other steel of the same Brinell hardness. The carbon in these steels, acting in the same manner as in plain carbon steels, has its effect greatly enhanced by the presence of these elements. The uses to which these steels can be put, as castings, by simply varying the carbon content with the same given content of chromium and molybdenum, with a variation in heat treatment, are so great that it would be practically impossible to give more than a brief list of these uses. The usual carbon range in these steels lies between 0.20 to 1.00 per cent, the chromium between 0.75 to 1.25 per cent, and the molybdenum is kept in the 0.20 to 0.40-per cent range. Where great strength or hardness is desired the carbon



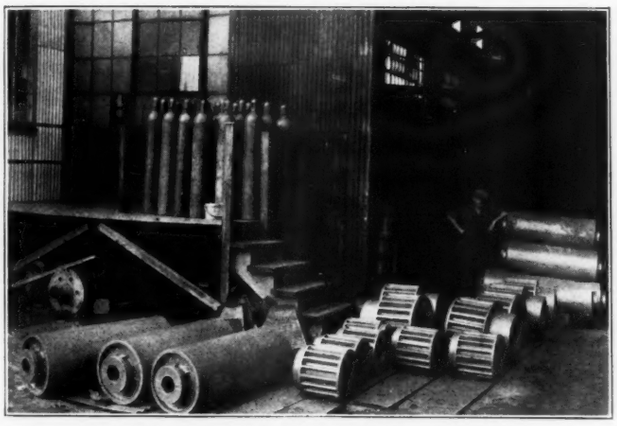
Dipper teeth made of chrome-molybdenum steel.



Centrifugal-pump casings of alloy steel.

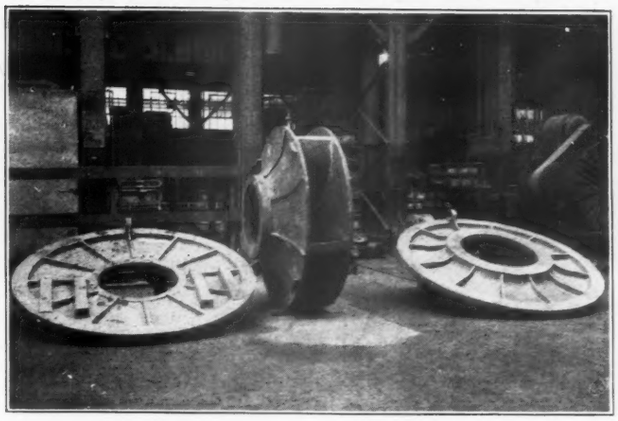
content will be high, and where toughness and ductility are the main consideration, it will be low. The hardness can be varied from that comparing favorably to a soft carbon steel to that represented by a Brinell numeral of 750. By tests these steels have been shown to outwear manganese steel on both wet and dry abrasion. There is no slippage of the metal along its plane of cleavage, and there is no drastic heat treatment necessary in order to develop its best properties. The heat treatment of these steels will be discussed later. A few of the uses to which these steels have been put, giving remarkable service are as follows: Liner plates for ball and rod mills, pulverizing-mill hammers, slurry pumps, impellers, casings, crusher dies, car wheels, bucket lips, gears and pinions, tractor shoes, shovel teeth, and other parts subject to severe abrasion, sudden shock or requiring great strength.

The methods of manufacture or melting practices that may be used are electric or open-hearth, either acid or basic, the quality of the metal and product being dependent upon the process as well



Rolls and pinions cast from alloy steel.

as the care exercised in melting. The addition of chromium in order to secure uniform results necessitates a little experience due to the loss by oxidation. If scrap containing chromium is charged in an open-hearth furnace, it will be found that a large part of the chrome is lost by the time the heat is melted down. This loss is taken care of in any practice by the addition of ferro-chromium, usually containing from 67 to 72 per cent chromium, with different ranges of carbon content. The oxidation loss in an open-hearth furnace is usually found to be from 5 to 20 per cent and in the electric furnace, if properly run, the loss is negligible. There need be no fear on the part of the foundryman intending to enter into the alloy-steel castings business that he need necessarily employ different methods for, as long as he produces good high-quality, carbon-steel castings, he can do the same in alloy steel provided he exercises the same care, perhaps exceeding that which he ordinarily uses. The addition of molybdenum to the steel can be accomplished either by the use of



Pump housings and impeller.

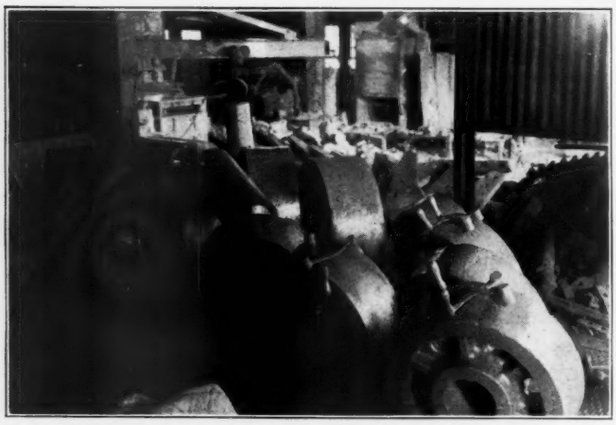
ferro-molybdenum or calcium molybdate, these being adherents to each practice. However, it is the author's experience that the calcium molybdate is the best in our particular acid electric process. There is no appreciable loss of this element in any practice, and the form in which it should be added can best be determined by personal experience, cost, or any other factor entering into the question.

In the founding practice for these steels, either green-sand or dry-sand molds may be used. A few general considerations or facts to be remembered are the heavy piping, extreme fluidity, and increased internal stresses set up in the mold. They usually require large feeding heads, the placing of these requiring a technique slightly different from that employed in plain carbon-steel practice. The pattern equipment need not necessarily be changed, except perhaps to take advantage of the saving in weight possible, or to establish a uniform metal section, with an elimination as far as possible of re-entrant angles, with generous fillets, these changes lessening greatly any possible danger in heat treatment, assuring a better product due to the proper heat treatment made possible, for notwithstanding the effect molybdenum exerts in regard to air hardening, some castings are so intricately designed, that proper heat treatment is impossible. The sand used, whether dry or green, may be the same as that employed for any high grade carbon steel, and the pouring, ladles and other features are the same as in the ordinary steel casting practice.

In the cleaning practice for these castings, a little extra care is needed in their handling, due to their comparative brittleness while in the "as cast" condition. Heads and gates are best removed by means of the oxy-acetylene torch. It is not to be advocated that these heads and gates be removed by means of a sledge hammer, even though it might require but a few blows to remove the same, as these same blows might result in the cracking of the casting either by accentuating casting strains already present, or by strains set up in the pounding. Whenever necessary, the steels can be successfully welded by means of either the electric-arc or oxy-acetylene-torch method. The

lower carbon content members of this group are very easily welded, no especial care being exercised, except to use an electrode or welding rod of like metal composition as the casting, but when the carbon is increased to above 0.60 per cent it becomes a more or less uncertain proposition unless the casting is preheated and welded while hot. This helps considerably in securing a strong uniform weld of this metal. The welding of these steels while cold is uncertain because of a weakening of the metal adjacent to the weld by the burning out of the carbon. The castings should always be welded before heat treatment but as this is the usual practice in any modern foundry, it is not necessary to stress it in particular here.

The development of heat treating in the foundry with the resultant high-grade product has been a potent factor in placing its product in the position it now occupies. It is only by heat treating that the virtues of many types of steel castings are so developed as to enable them to occupy the important position they have in the commercial world.



These trunnions were cast of alloy steel.

It is unquestionably poor practice to add an alloy to steel and then use it in its raw state. The temperatures at which various treatments of these steels are made are as follows:

Annealing—Heat to 1,550 or 1,650 deg. F. and cool in furnace.

Normalizing—Cool in air from 1,600 to 1,800 deg. F.

Quenching—In water—From 1,500 to 1,575 deg. F.

Quenching—In oil—From 1,575 to 1,650 deg. F.

Tempering—Maximum temperature of 1,300 deg. F.

Typical tests show:

Elastic limit, 84,500 lb. per sq. in.
Tensile strength, 140,000 lb. per sq. in.
Elongation in 2 in., 14 per cent.
Reduction of area, 29.1 per cent in 2 in.

It is to be remembered that these steels possess the property of air-hardening, lessening considerably the danger in properly heat-treating large or intricate castings. Small castings which are not liable to crack or warp are best treated by quenching after the first heating in either oil or water and then drawn back to the desired degree. For large castings an air-quench is the usual practice. The usual treatment of a chrome-molybdenum steel consists of an anneal at 1,550 deg. F. for four hours with a slow cool in the furnace, followed by a reheating to 1,600 deg. F., being held for two hours and allowed to cool in a draft of air, this treatment being followed by a draw at 1,250 deg. F. In this way the best possible properties of the steel are developed and the casting thus treated is really worthy of being classed as a high-grade, alloy-steel product.

Not the quoted prices but the economical costs are to be considered in an alloy casting. The quoted prices are not fair indices. The reduction in weight and increased service life alone are to be considered when buying a high grade alloy casting to replace one of a plain carbon or inferior alloy steel. This saving in weight is considerable when it is remembered that at times a reduction of 40 per cent in the stressed parts is possible. The increased cost of the steel is not only due to the alloys used but also due to the extra care necessarily exercised in molding and cleaning room practice.

It is merely attempted herein to briefly outline the foundry practice, the manner of product produced, and the use in the engineering world present and future of chrome-molybdenum steel castings. It is to be stressed here that the analysis of the metal from which an article is produced is no conclusive evidence of its serviceability. Heat treatment is a very vital factor in producing a high-grade alloy-steel casting and the position occupied by the heat treater in a foundry is greatly advanced, being more appreciated and used.

The development of alloy-steel castings has by no means ceased and new uses are daily being found for them in engineering world and chrome-molybdenum steel castings can be and are adapted to many of these new uses.

Cement Association Issues Booklet on Shore Protection

To compensate for a lack of general information on the subject, a booklet on shore protection has just been issued by the Portland Cement Association, Chicago. This publication deals with waterfront structures generally and shows, by means of much illustrative material, how the protection problem has been successfully handled in various communities.

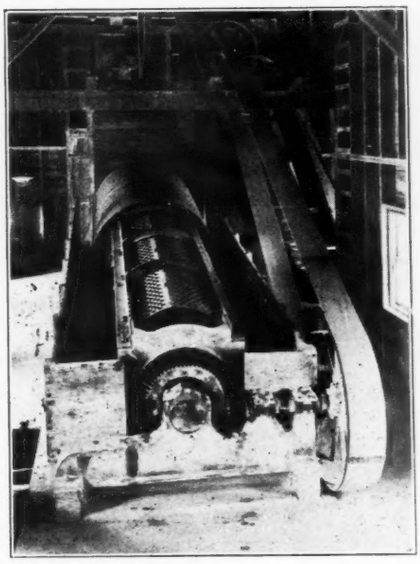
"Concrete Shore Protection," is the title of this 32-page publication. The introduction states that "of all materials available, concrete is the most resistant to the action of the elements, salt water, marine borers, and other destructive agents. Like any other material, it must be used intelligently, with full advantage taken of present-day knowledge, and with due regard to past experience."

Abandons Quarry for Underground Mine to Save High Stripping Costs

Columbia Quarry Co. Mines 350,000 Tons of Limestone Annually at Valmeyer, Ill.

BACK in the Ordovician period of geologic time a formation of high-calcium limestone was laid down in the area covered by southern Illinois and Missouri. Later a river, rushing on its way to the ocean, cut through the layers of limestone and exposed in its bluffs the Kimmswick formation which to-day furnishes the major portion of basic flux used by the metallurgical industries in the St. Louis district.

Located near the Mississippi River at Valmeyer, Ill., thirty miles south of St. Louis, Mo., the Valmeyer plant of the Columbia Quarry Co. is rapidly gaining an enviable reputation for efficiency in the mining of Kimmswick limestone. Working two 8-hour shifts per day, 25 days per month, the daily output of sized material averages 1,200 tons, the major portion of which is shipped over the Missouri Pacific Railroad to East St. Louis and Granite City, Ill., for use in the iron-and-steel and aluminum industries of that district.



Revolving screen 24 ft. long showing belt drive.

Quarry operations were begun at Valmeyer more than ten years ago and large tonnages of limestone have been produced during the past years. Two years ago, because of the increasingly heavy overburden which was making stripping an unusually costly operation, it was decided to abandon the open-quarry method and turn to room-and-pillar mining. A close check-up of mining methods was made and a definite plan outlined. This plan has been followed consistently and rooms 42 ft. wide and 28 ft. high are cornered by substantial pillars.

The drilling method used is simple but efficient. Holes 15 ft. deep and four to a line are drilled along the wall of the room with Gardner-Denver No. 7 drifters mounted on 18-ft. columns or on

Locomotive and two carloads of stone en route from mine to plant. Note old quarry face and the heavy overburden.

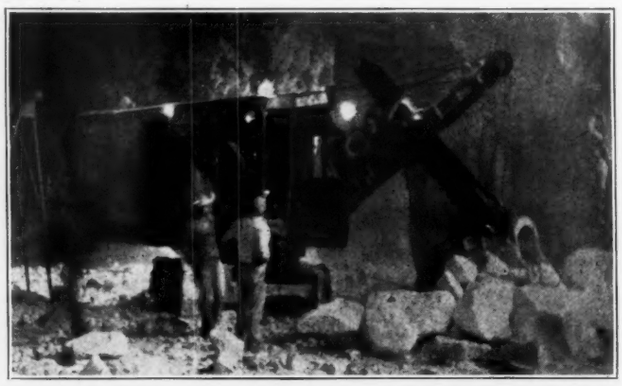
Two carloads of stone being hauled by a gasoline locomotive. Explosives are stored in a chamber cut from the pillar behind the cars.

tripods. Drillers work on scaffolds constructed of light-weight wood which can easily be moved to a place of safety before the shots are fired. The holes in the "back" require good judgment on the part of the drillers to prevent "burning" and subsequent roof trouble, and receive close attention at all times. About 80 holes are drilled to each room, a total of 250 ft. of drill-hole being obtained per drill-shift. The holes, which are 15 ft. deep, are loaded with du Pont or Illinois 35-per cent dynamite by a powder man and helper. Electric firing is used in all blasting operations except in the breaking of boulders, where the cap-and-fuse method is used. Thus the dangers from "hand-fires" is brought to a minimum. A Gardner-Denver jack-hammer is used in drilling the large boulders brought down by the roof shots. So efficient is the Valmeyer system of mining that 1¾ tons of rock are broken per pound of powder and 2 tons per foot of drill-hole.

Proper precautions have been taken in the storage of blasting caps and dynamite. Inside of the mine a "drift round" has been shot out of a pillar for the storage of the powder needed for the day's shooting. Outside are two well-constructed buildings set far apart and each a long distance from any operations. In one is stored blasting caps and igniters, while the other houses the powder. Every precaution is taken to prevent the occurrence of blasting accidents.

The problem of ventilation is one which has been dealt with in a simple and effective manner. As the working faces have moved farther and farther away from the main tunnel opening, adits have been shot through along the bluff on both sides of the hill, allowing currents of fresh air to circulate throughout the workings, clearing away all powder smoke and the small amount of dust which results from the drilling operations.

In the mine, as well as in the surface plants, good housekeeping is considered an important part of the day's work, and the results of the management's endeavors along this line can be seen in all places.



Crawler-mounted electric shovel which loads all rock.

Holes near the floor are drilled with tripod drills.

Two air compressors, a Sullivan angle-compound 17-in. by 10½-in. by 12-in., directly connected to a 150-hp. General Electric synchronous motor, and a 9-in. by 14-in. by 9-in. by 12-in. Ingersoll-Rand, driven by a 75-hp. Wagner Electric motor, supply the air for drilling operations. The Sullivan compressor delivers an ample air supply for all drills while the auxiliary machine serves when part of the equipment is idle, or in cases of emergency. The compressors are housed in a recently-constructed building and are kept in first-class condi-

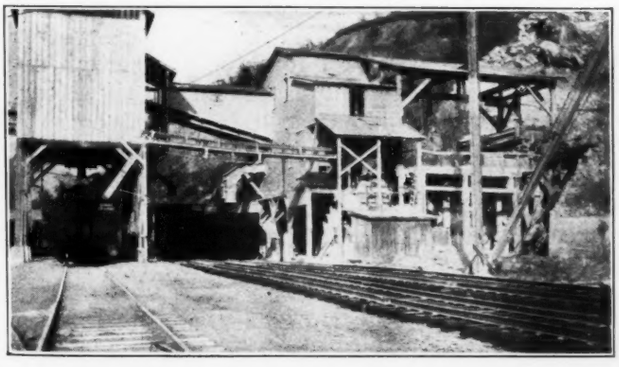
tion at all times. An oil house, also of recent construction, is but a few steps from the compressor-house door.

The Valmeyer system of loading is much the same as that used by those mining companies that are keeping pace with the present trend of mechanization. The old method of hand loading has given way to the power shovel. A special Bucyrus electric shovel with a 1½-cu. yd. bucket loads the rock into 7-ton side-dump cars which have been built by the company on Koppel trucks. A switch in the track leading to the face in which the shovel is working allows two cars to be spotted on sepa-

Note heavy overburden which prompted the company to mine underground.

rate tracks within reach of its 14-ft. boom. As the cars are loaded they are picked up by 8-ton Plymouth gasoline locomotives which pull them to the sidings in the main tunnel, from which they are hauled, two at a time, by an 18-ton Plymouth down an 8-per cent grade to the crushing plant.

As the two 7-ton cars loaded with limestone reach the plant they are dumped, by means of a 12-in. Curtis air hoist, directly into a No. 12 Allis-Chalmers gyratory crusher. A 36-in. conveyor



Direct loading into cars saves space and labor.

manufactured by the General Conveyor Co. of St. Louis, runs underneath the crusher and carries the rock to a 28-in. home-made bucket elevator which deposits it into a 60-in. by 24-ft. Gruendler revolving screen. Here the material is separated into three sizes: Minus 2-in., 2-in. to 6-in., and 6-in. and over.

The 2-in.-to-6-in. size is ready for shipment to

Showing how the outside wall of a room or chamber can be cut to provide ventilation.

blast-furnace operations and is chuted into gondola cars. At times the 6-in.-plus material is also loaded into cars over a home-made conveyor for open-hearth mills, but occasionally it receives further crushing. When this is the case, it is carried over a 24-in. Stephens-Adamson conveyor to a No. 4 Symons cone crusher where it is reduced to 2 in. and returned to the revolving screen. The gyratory crusher, revolving screen, elevator, and conveyors mentioned in this paragraph, are driven by a 150-hp. Allis-Chalmers slip-ring motor while a 100-hp. Allis-Chalmers induction motor furnishes the power for the Symons cone crusher.

The minus 2-in. material drops from the Gruendler screen onto a 24-in. belt conveyor with Stephens-Adamson carriers, built by the Columbia Quarry Co., and is carried to a 4-ft. by 8-ft. double-deck Niagara screen which is driven by a 5-hp. General Electric motor. The 2-in.-to-⅞-in. product from this screen is chuted directly into cars for shipment while the ⅞-in.-minus goes to a 3-ft. by 4-wt. Traylor vibrating screen. The 3/16-in.-to-⅞-in. vibrator product has a ready market in the metallurgical field and is loaded directly into cars, while the dust (minus 3/16-in. material) is chuted to cars or conveyed over a 16-in. home-made conveyor equipped with Stephens-Adamson carriers, to storage piles. The dust is a good fertilizer for fields deficient in lime and is used extensively on farms in southern Illinois.

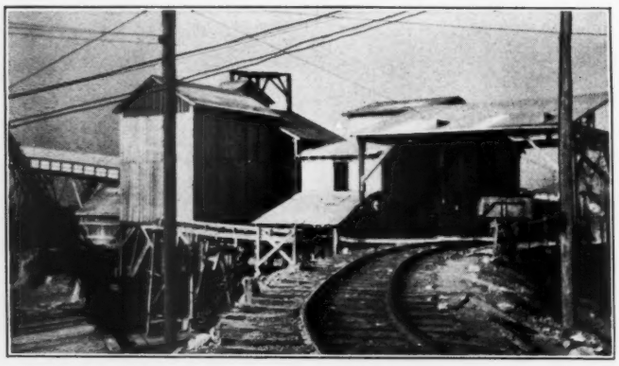
For stock piling the minus 3/16-in., an Ohio 22½-ton locomotive crane, powered by a Climax 6-cylinder gasoline motor, is used in addition to

Main entrance to the mine.

the conveyor. The crane also reclaims any size that must be stored.

All surface buildings are of sturdy construction and the ship-shape manner in which all machinery is placed bespeaks the company's desire for all-round efficiency. No dirt or foreign matter of any kind can enter the product since all mining is carried on within the uniformly pure Kimmswick formation.

A Mundy electric car-puller spots the 50-ton railroad cars under the loading bins. Recently-laid 85-lb. rails on creosoted ties make a sound, perma-

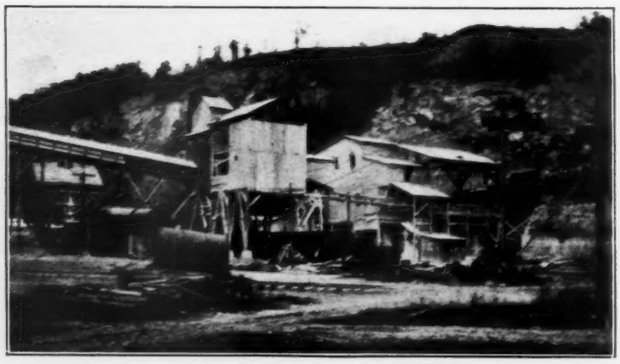


Loaded cars ready to be dumped into crusher at plant.

nent foundation for the large tonnages which pass over them.

A modern machine shop fully equipped with an 18-in. by 8-in. lathe, a drill-press, and a shaper handles all ordinary jobs. In this building are located also an Ingersoll-Rand No. 50 drill sharpener and an oil furnace made by the same company. Electric power for all operations is furnished by the Illinois Power & Light Co.

The Columbia Quarry Co. believes in treating its employees in the best way possible. A large percentage of the men who work at the Valmeyer quarry are residents of the town of Valmeyer, but for those who are not, the company provides pleasant living quarters as well as a non-profit



View of crushing, screening and loading plant.

restaurant. At the time the writer visited the property he overheard several remarks by workmen which indicated that they were well pleased with the meals served at this restaurant.

A group-insurance plan provides free insurance for all employees. Bulletins on safety and other subjects are displayed at the property and receive the attention of the workmen. Through these various activities and through a rigid policy of fair-dealing, a fine spirit of cooperation has been developed among the workmen.

The president of the Columbia Quarry Co. is E. J. Krause, whose general offices are in the Syndicate Trust Building, St. Louis, Mo. C. H. Krause is vice-president and H. F. Schmitt, secretary and treasurer. H. C. Krause is sales manager. The Valmeyer quarry is operated under the direction of P. G. Forman, superintendent; Charles Asselmeier, general foreman; Charles Loewe, foreman; and T. S. Cheney, office manager.

Produces Ready-Mixed Concrete

(*Continued from page 29*)

Each compartment of the bins discharges into Johnson 14-cu. ft.-capacity batch hoppers. These discharge into a 32-cu. ft.-capacity steel car on a structural-steel tramway serving all of the hoppers and discharging directly into the Cement Products Corp. 21-cu.ft.-capacity mixer.

The mixer discharges directly into a Besser Junior stripper block machine which has attachments for making face-down block and many other sizes and types. Over 3,200 blocks have been made by this machine in a 9½-hr. day. The products mixer is belt-driven by a 35-hp. General Electric motor, and the block machine by a 7½-hp. motor of the same make. United States Rubber Co. drive belts are used. Ample space is provided for three more mixers and block machines.

The finished blocks are loaded onto steel racks which are hauled on a Barrett lift-truck into the concrete curing tunnels. Here they are cured for 36 hours at a temperature of 76 deg. A Sullivan 4-cylinder air compressor, driven by a direct-connected 50-hp. motor, pumps air directly into the kilns. Heated water goes through an American Moistening Co. humidifier to the kilns. The air and water lines both feed to the same valves which break the water into a fog-like spray, furnishing an ideal condition for curing the block.

The electrical equipment in this plant consists of a Noark feeder-box switch, Bulldog and Square D safety switches, an Industrial Controller Co. automatic switch, and a General Electric Co. compensator and pressure governor for the air compressor. National Electric Products Corp. Shear-arduct conduit is used.

A room adjoining the block machine room houses a Watson-Stillman hydraulic jack (equipped with a pressure gauge), which is used for testing blocks and concrete test cylinders. Air for this machine, which exerts pressure up to 400,000 lb., is furnished by the compressor previously described. The steel for the testing machine, the block racks and the steel tramway furnished by the Mississippi Valley Structural Steel Co.

Officers are: W. G. Traylor, president and treasurer; R. J. Monroe, vice-president; and Francis B. Traver, secretary.

Developments in Design of Churn Drills for Quarry Blast Holes

Wire Supplants Manila Rope and Steel Replaces Wood for Framing Machines

THE common well-drilling machine is of that type which operates with a chisel bit used as a combination chisel and hammer and striking a gravity blow, the bit being suspended on a cable and raised and lowered by means of some mechanism on the surface of the ground. This method of making holes in the earth has been known for centuries. The Chinese were familiar with it before the days of Confucius. Modern development of the portable well-drilling machine in America began with the use of a spring-pole and set of 3-in. drill tools in the Kanawha salt district about 1800. From this beginning have been developed the various types of portable cable well-drilling machines and stationary or standard oil-well rigs.

Until recently the material used for the structure of well-drilling machines and rigs was universally wood. Oil rigs were constructed originally of timbers hewn out of the forest. The best grade obtainable of hawser-laid, manila hemp cable was used for lowering the drilling tool into the well, and was attached to the drilling tool by means of various forms of rope socket which were found to be dependable.

Within recent years, structural steel has been used, to some extent, in place of wood for the framing of well-drilling machines, and has been found to have numerous advantages. First, it makes possible a lighter and stronger, as well as a more durable frame construction at no additional cost, since lumber has been constantly rising in price while the cost of structural steel has remained reasonably low. Another consideration which has a bearing principally on the export market for American well-drilling machinery is that, in most tropical countries, steel framing is preferable to wood. Not only the effect of heat and dampness upon frame construction has to be taken into account, but there are many places where insects attack wood construction with equally destructive results.

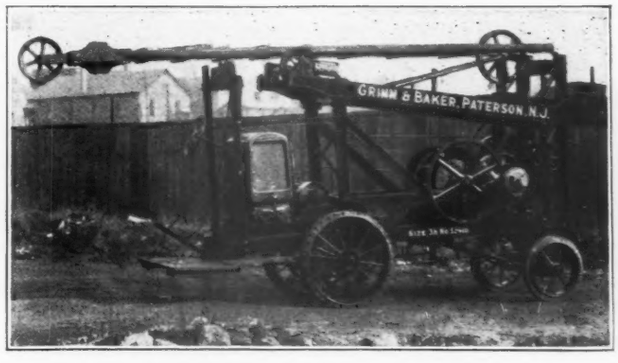
Suitable wire drilling cable costs considerably less than manila hemp of proper capacity and lasts a great deal longer. Since the capacity of most drilling machines is determined by the length and diameter of their cable drums it will be perceived that the substitution of wire line, which is very much less in bulk than the manila cable, has in most cases doubled the depth capacity of the machine on which it is used.

With the adoption of structural-steel framing for well drills, and steel line for drilling cable, manufacturers lost the advantage of the two great factors of resiliency to be found in wood-frame construction and manila cable. A 1½-in. manila line with a 2,000-lb. drilling tool will stretch about 6-in. to the 100 ft. with some variation, depending on whether the cable is wet or dry. Experienced well drillers for generations have been accustomed to drill on what they call "the spring of the cable," and it has been believed, and is probably true, that this method of operation gives the highest degree of efficiency in cable-tool drilling. However, with the adoption of steel line, which has practically no stretch, and the use of steel construction in the frame of the machine and derrick, the shocks produced by the rapid lifting and dropping of the drilling tool were found to be most destructive to the machinery. A high degree of efficiency was obtained in the drilling but at the expense of clutch failures and bent and broken shafts and gears.

Manufacturers of well-drilling machinery set about to devise some means of absorbing this shock and of introducing a substitute for the factor of resiliency lost by the abandonment of manila cable. Some of the devices tried with more or less success have been, first, a spring rope-socket. A successful tool of this type has been developed by K. C. Archibald of Council Bluffs, Iowa, a well-drilling contractor. Second, a spring mounting under the crown pulley. Third, a spring in the derrick or mast. Fourth, a spring under the front spudding-sheave. Fifth, a spring mechanism in the drilling-crank gear.

The spring under the crown pulley has the advantage of giving 2-in. of stretch for 1-in. of compression but is open to the objection, raised by all well drillers, of having any heavy mechanism in the derrick.

The dual rubber cushions located on an extension of the walking beams at the rear have been



Well drill for use with wire drilling cable.

Traction blast-hole drill equipped with cushion shock absorbers.

found to be entirely satisfactory for the elimination of undue strains and shocks when operating with wire line. One illustration herewith shows a No. 3½ Keystone well-drilling machine, equipped with 35-hp. crossmounted, 4-cylinder gas engine, rubber-tired road wheels, and the dual rubber-cushion shock absorbers for operation with wire line. The machine is of wood-frame construction. It has a depth capacity with manila cable of about 400 ft. and with wire line about 800 ft. The machine is adapted for blast-hole drilling in quarries, in which case the mounting would consist of plain iron-tired wheels, or half-crawler apron wheels. For the uses of the water-well contractor, who has rapid and long moves to make over cement roads, the rubber-tired wheels are essential. The other illustration shows a smaller and lighter machine, size No. 1½, all-steel construction, but equipped for use with manila cable. This machine weighs about 10,500 lb. It is equipped with rubber-tired wheels for rapid movement over cement roads and has a traction speed of about 8 miles per hour, and can be furnished with dual-cushion shock absorbers when it is desired to operate it with wire line. It is powered with a 20-hp., 4-cylinder cross-mounted engine and will handle conveniently a 1,600-lb. drilling tool. Its drum will spool comfortably about the same amount of manila cable and wire line as will the No. 3½ machine. As far as actual depth capacity is concerned the two machines are on an equality, but the larger outfit will, of course, handle heavier tools and will drill more rapidly. Either one of these machines can be furnished with plain, non-traction iron-wheel mounting for operation in districts where roads are unpaved or where it is desired to move the machines from place to place by tractors or draught animals.

Value and Output of Salt in 1929 Both Show Increase

The salt manufactured and sold in the United States in 1929 amounted to 8,543,560 short tons, valued at $27,334,695, according to reports of the producers to the United States Bureau of Mines, Department of Commerce. These figures, compiled in cooperation with the Geological Surveys of Kansas, Michigan, New York, Texas, and Virginia, show an increase of 6 per cent in quantity and of 2 per cent in value over the sales for 1928, which were 8,074,700 short tons, valued at $26,772,568.

Evaporated salt, which represented 30 per cent of the total sales in 1929, amounted to 2,546,390 tons, valued at $17,921,922, an increase of 5 per cent in quantity and less than 1 per cent in value. Rock salt, which represented about 25 per cent of the salt produced in 1929, amounted to 2,113,010 short tons, valued at $7,127,681, a decrease of 5 per cent in quantity and an increase of 3 per cent in value.

The salt content of brine produced by chemical companies and used by them for the manufacture of different chemicals amounted to 3,884,160 short tons in 1929. This was 45 per cent of the total salt production and represented an increase of 13 per cent in quantity over 1928, when the production was 3,426,870 short tons.

The figures of evaporated salt and rock salt include 213,040 tons of pressed blocks made by the salt manufacturers and valued at $1,723,824, an increase of 18 per cent in quantity and 15 per cent in value over the output of 180,650 tons, valued at $1,499,420, reported for 1928. In 1929, 172,120 tons of the blocks, valued at $1,392,427, were made from evaporated salt, and 40,920 tons, valued at $331,-397, were made from rock salt.

Michigan, New York, Ohio, Kansas, Louisiana, and California, in the order named, are the largest producers of salt. Michigan produces the most evaporated salt, and New York the most rock salt. New York, Louisiana, Kansas, and Michigan together produce 98 per cent of the rock salt. Michigan, New York, Ohio, and Virginia in the order named produce the brine, the salt content of which is used in the manufacture of chemicals.

Applying Safe Practices in Metal Mining to the Pit and Quarry Field

By O. N. WAMPLER
Safety Director, The Eagle Picher Lead Co.

I HAVE been asked whether or not, in my opinion, there are phases in the safety and industrial relations of metal mining, which may be adopted in the non-metallic industries. It seems that many persons are prone to believe that there is a radical gap between non-metal and metal lining.

There is really very little difference in the non-technical practices in the metal and non-metallic mines. The two industries should each be able to exchange ideas to good advantage. Possibly if we had called pits and quarries "mines" the two industries would have been more closely allied in years past. I personally am not sure but what they are more closely allied than metal and coal mining.

In the National Safety Council the coal and metal mines are organized into one group while the pits and quarries are placed in another group. The most serious problem encountered in coal mining is the danger from gas and coal-dust explosions. There is practically no danger from this source in most metal mines. On account of the serious danger from such explosions, the thoughts along safety lines in coal mines are towards extensive mine ventilation and rock dusting. Therefore the bulk of safety propaganda put out in the interest of the coal industry is of very little interest to the members devoted to metal mining.

One radical difference between metal mines and pits and quarries is that most metal mines have shafts while pits and quarries are either tunnel mines or open pits. There is, however, a shaft mine in Tennessee devoted to the mining of limestone exclusively. We cannot say that quarries do not have hazards from falling roofs, since many quarries are now tunneling in preference to the open-pit method of mining. My first suggestion along safety lines is that all quarries employing the tunnel method hold one man responsible for the condition of the roof. We call this man a roof trimmer. Each Eagle Picher mine employs at least one roof trimmer who devotes his entire time to keeping the roof and pillars trimmed in a safe condition. A few years ago I was called to St. Louis to learn why a certain quarry had so many accidents from the fall of roofs. As two or three fatalities had occurred, the situation was becoming serious. After making an inspection of the property, I inquired whether a regular roof trimmer was employed and, as the answer was "yes," I requested that he be called in. After some confusion, I was advised that the first man to finish drilling was supposed to do this work. My remark was that all were no doubt very careful to see that they did not have time for this extra work. I also found that the one roof bar was so heavy that at least two men were required to handle it. I recommended that they purchase several small steel bars of different lengths, which could be handled by one man. Since this was a rather small quarry and would not require the full time services of one man, I suggested that the same man be employed to look after both tracks and roof. I later learned that, by following out these simple suggestions, this quarry soon attained an enviable safety record.

Pits and quarries have their share of premature explosions when loading holes for blasting. From my personal experience as safety engineer during the past eighteen years, I am quite certain that practically all of these premature explosions are caused by the tamping bar striking the detonator, or the detonator striking the side of the drill hole. The Eagle Picher concern for the past three years has been covering all shots with a shot protector. This protector is simply a cardboard mailing tube closed at one end. After the stick of powder is made up, with its detonator and fuse, the tube is slipped over the shot. This tube protects the detonator shot from the chance of explosion from a sudden jar. Previous to the use of this shot tube we had several fatalities, but none have occurred since their use.

All our shovelers or muckers are required to wear wire-screen goggles when sledging boulders. These goggles are worn either on the hat or around the neck, so they may be put into use with little effort. All quarries which load rock by hand will find that the above requirement will eliminate many eye injuries. Wearing of goggles should be rigidly enforced.

We also require that each boulder be sledged down to 50 pounds or less before it is loaded by hand. Since one man can easily load a 50-pound rock we do not allow two men to lift on

A mistake is made by some persons in assuming that there is no similarity between the duties of employees in pits, quarries and metal mines. Many practices in these industries are analogous. Differences that remain are steadily diminishing and this fact is being given increasing recognition by safe-practice organizations. It was with this premise that PIT AND QUARRY *invited Mr. Wampler to express his views as to how far safety practices in lead and zinc mining could be applied to pit and quarry activities.*

the same boulder. This rule has reduced our strained back accidents more than 50 per cent.

About the same precaution must be taken in ore-concentration plants and cement or rock-crushing plants. Since the ore is ground or crushed by the wet method in metal mines, they do not have to worry about dust respirators. However, the smelters have their dust problems, which are probably more serious than those in cement plants. Our former practice was to furnish a man with a dust respirator and pay very little attention to whether or not it was ever worn. In several departments of the smelters, we now require the men to wear dust respirators during the entire shift. We find that a simple request to wear them does not achieve results. If a man fails to wear his respirator he is laid off for a short period, but if he continues to violate the rule, he receives a permanent discharge. Since the man knows that this is an iron-clad rule we have very little trouble from this source.

O. N. Wampler.

The Eagle Picher Lead Co. has given bonuses for good accident records for the past four years. The mine foreman receives a bonus of $20 when his mine goes through the entire month without a lost-time accident. Much has been said for and against a bonus for good accident records. Our company's experience leaves no doubt that the bonus pays. The number of lost-time accidents was immediately reduced after the bonus system was adopted. Previous to the bonus system, the foreman took very little interest in an accident after it occurred. In other words he knew that it was his business to prevent accidents but, after the accident occurred, he considered that the responsibility was up to the claim department. With the bonus system in effect, the foreman usually accompanies even the slightly injured to the doctor. He waits until the injured is treated and then, with the doctor's permission, brings the man back to his job. Many a lost-time accident is avoided by this personal interest of the foreman.

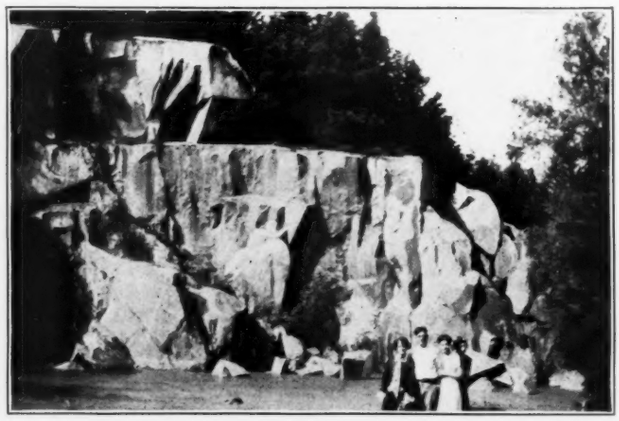
All our new employees are required to submit to a complete physical examination and the regular employees are required to have the same examination yearly. There is no charge for this service. The company is exceedingly liberal in acting on the information furnished in this examination. No men are barred except those afflicted with contagious diseases, ruptures, high-blood pressure, or exceedingly poor eyesight. With old employees the company goes further and helps to correct the above defects, if possible.

Acquires Huge Gravel Deposit to Add to Wisconsin Granite Holdings

The Kewaunee Gravel Co. with headquarters in Milwaukee, Wis., has acquired a tract of land at Luxemburg, Wis., having an estimated sand-and-gravel reserve of 12,000,000 cu. yd. The property

Sand and gravel property near Luxemburg, Wis.

is within 11 miles of Lake Michigan so that the company contemplates the lake transport of sand and gravel to Milwaukee, Chicago and other lake-port markets. The company should enjoy, also, a substantial market in nearby cities. A financial program includes the installation of a complete excavating, washing and screening plant.



Granite quarry, Green Lake County, Wis.

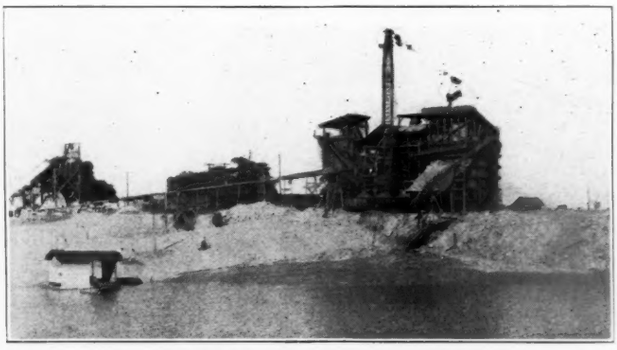
The company owns, also, a granite property of 160 acres at Puckaway Lake, Green Bay Co., Wis. A quarry was opened here originally to provide red and gray granite for exterior walls and interior trimming of the Pfister Hotel, Milwaukee. Owing to lack of railroad facilities, the quarry has since remained idle. New development is planned for the near future, starting with about 45,000 cu. yd. of chips that are suitable for road work.

Dredge and Gravel Plant Embody Latest Developments in Construction

Line Production Methods Enable Texas Operator to Keep Production Costs Down

By T. K. KNOX

THE W. D. Haden Co., with its general offices located at Houston, Tex., embraces, in its many affiliated companies, a complete supply business for building material. Under its banner is listed one of the most modern lime plants in the country. Its fleet of hydraulic dredges and tugboats is so large that one of the town wits of Houston recently declared that the company was to be included in the next naval conference! The company possesses, among its several plants, one of the best-designed and most interesting gravel plants in the southwest, located at West Point, Tex.



View of old plant showing screening tower.

Most of the sand-and-gravel plants in the fast-growing and prosperous region about Houston get their material along the Colorado River. The Haden plant is located one mile west of the beautiful town of West Point, Tex., on the Missouri, Kansas & Texas and Southern Pacific railroads.

With a capacity of 80 carloads of washed, screened and graded gravel a day, this plant is one of the largest on the Gulf coast. Two interesting and unique features make it worthy of study—line production methods and a hydraulic pump dredge which expresses the latest ideas in engineering design.

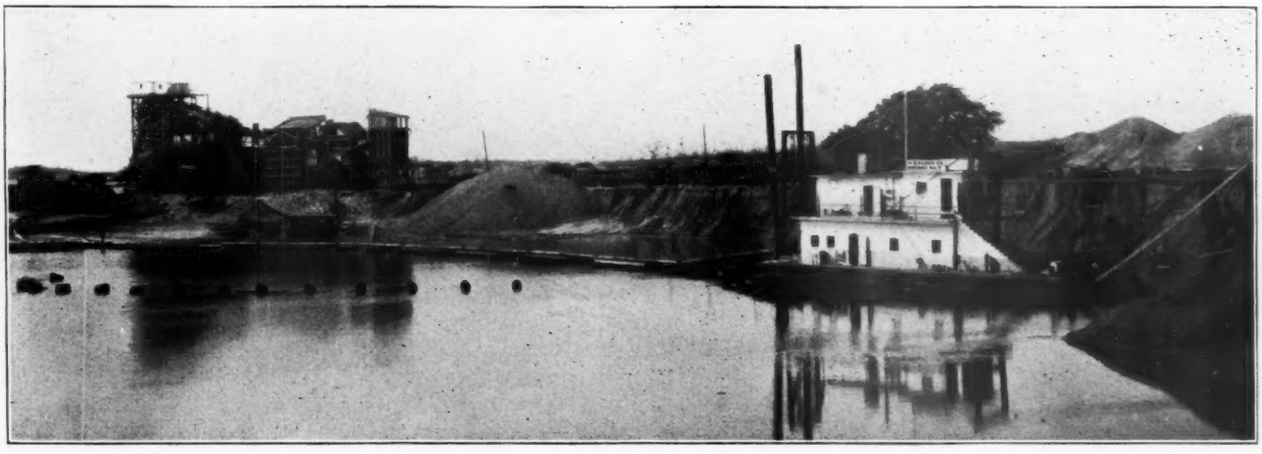
A heavy-duty, 15-in. Amsco Type H sand-and-gravel dredge pump is direct-connected to a 500-hp. motor on board the dredge. All hull piping and fittings are of Amsco design and are of manganese steel.

The hull is 76 ft. long, 34 ft. wide and 7 ft., 10 in. deep. The ladder-well opening is 24 ft. long by 10 ft., 8 in. wide. The hull is of heavy timber construction. A heavy, structural-steel ladder, carrying a rotary cutter with a spider-hub arm and renewable blades, is used for digging the deposit.

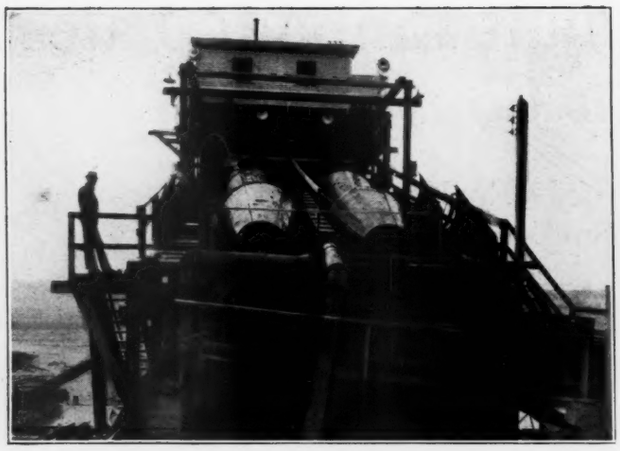
A 5-drum Ellicott dredge hoist is used for all line work. Hydraulic-ram lever-controls manipulate the frictions and brakes. Extending outside the cabin walls are auxiliary winch heads which are used for handy line work.

The cabin is of wood-frame construction, the main portion housing the engine room and hoist, while the upper portion houses the operator's lever room. A cupola contains the resistance grids for the dredge-pump motor.

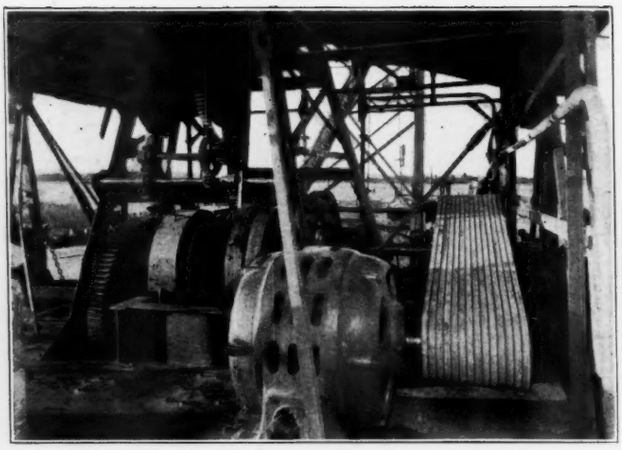
Individual electric motors are used to drive all equipment. All motors on the dredge are Fairbanks-Morse, ball-bearing equipped. The American Manganese Steel Co. supplied the dredge-pump and hull pipe-line fittings after a careful hydraulic



General view of the operations showing plant and dredge.



The two lines of conical screens.



Motor driving drag winch on excavator.

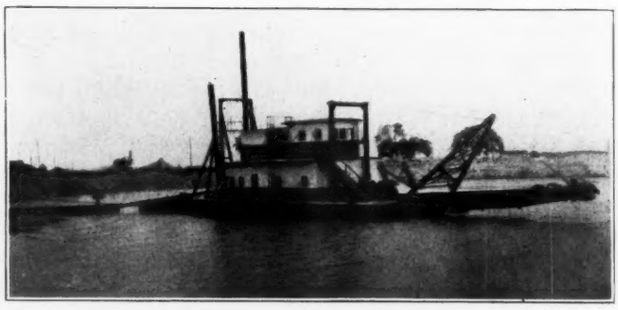
survey of the property's requirements by its engineers. The Ellicott Machine Corp. supplied all other dredge equipment.

In the gravel plant, judiciously selected production methods are successfully used to lower production costs. The layout of the plant was designed, as far as possible, to eliminate any duplication in the handling and movement of materials within the plant.

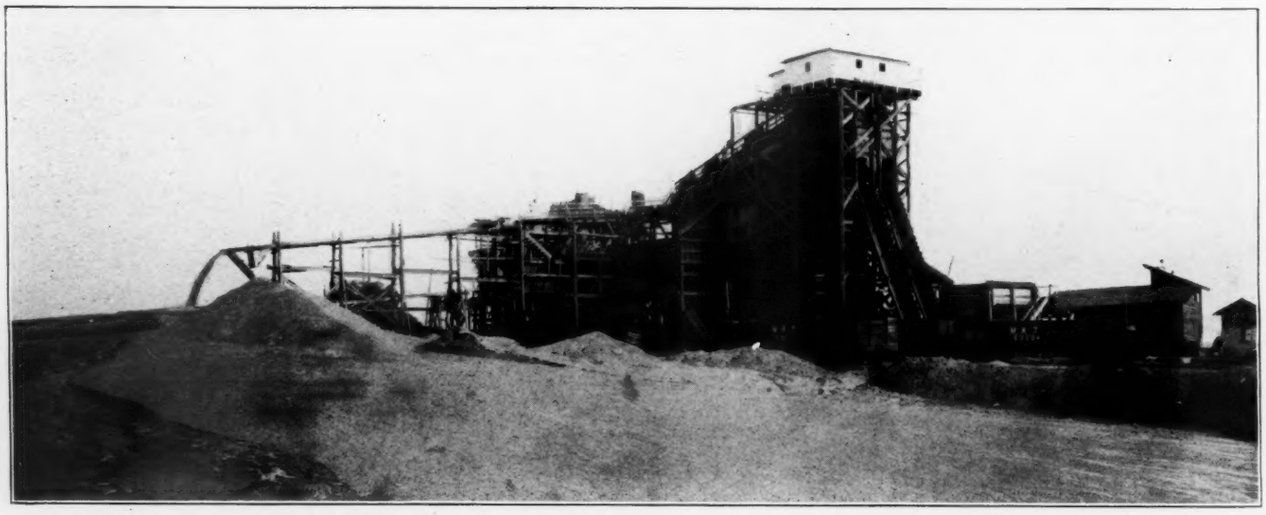
The material is pumped by the dredge and discharged to a concrete sump, 52 ft. long by 16 ft. wide by 9 ft. deep. The pump discharges directly into a dewatering bin from which the gravel and sand flow by gravity into two sluices.

From the concrete sump the material is picked up by two Link-Belt 30-in. by 12-in. by 18-in. continuous-bucket dredging elevators on about 75-ft. centers and slightly inclined. These elevators are designed especially for this service and are made extremely heavy and rugged, manganese steel being used wherever possible. The buckets are made of heavy steel, heavily reinforced and are carried on a double strand of manganese-steel chain. The head sprockets are made with removable manganese-steel-toothed, flanged traction wheels. Each elevator is silent-chain driven by a separate 40-hp. 900-r.p.m. Fairbanks-Morse motor, with spur-gear reduction and equipped with a differential band brake to prevent backward motion in the event that power is shut off.

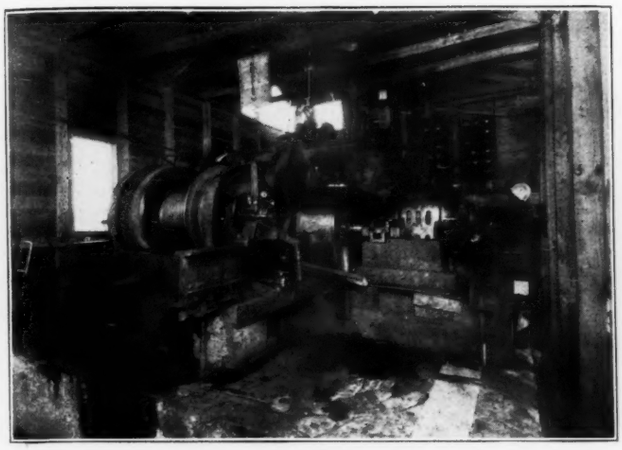
The material from the elevator discharges to two lines of 36-in. by 72-in. by 96-in. Link-Belt conical screens, both of which are driven by a 40-hp., 900-r.p.m. Fairbanks-Morse motor. Speed reduction consists of a Link-Belt silent chain and cut spur gears, and the drive is arranged with clutches so



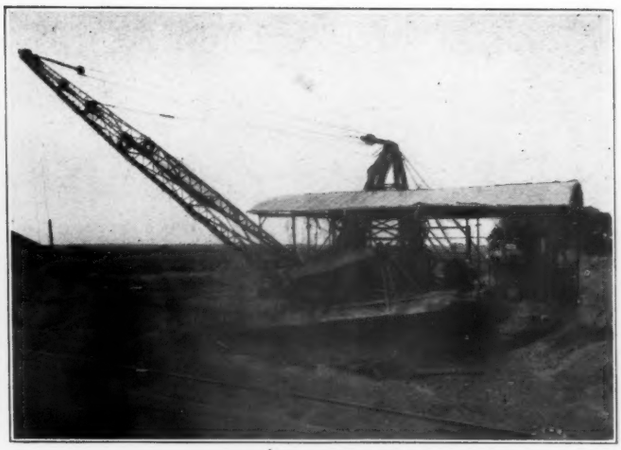
Close-up of dredge showing cutter head.



View of the gravel plant showing its efficient and compact construction.



The 125-hp. motor on the hoist.



Dragline excavator with 3½-cu. yd. scraper.

View showing storage and loading yard.

that each line of screen can be operated independently.

Briefly, the flow of material is as follows: The classifiers first remove the large stones which are subsequently passed through a crusher and are then returned to the sluice bins. The sized sand and gravel are deposited directly into the storage bins over the shipping tracks. The first screen on each line acts as a scalper and the material from this is discharged through a chute direct to an Allis-Chalmers crusher, mounted over the sump.

All of the other six screens are provided with various-sized perforations so that six distinct sizes of gravel may be produced, or can be mixed together in any proportion desired. The gravel bins are also arranged so that three different-sized materials can be mixed together as they are loaded into cars.

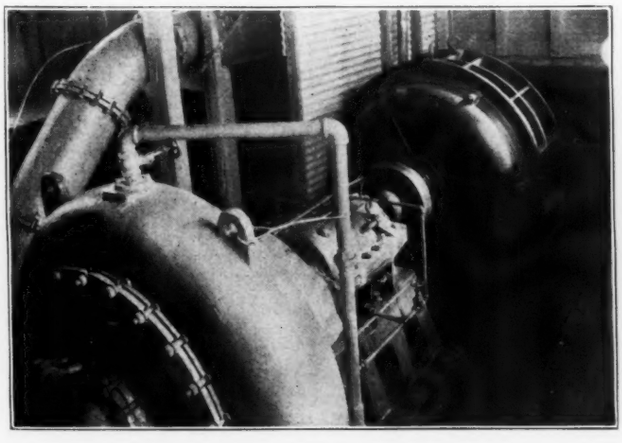
After the plant started operating, gravel jigs were installed and are used for washing. These jig washers are of the company's own design and make and have given most satisfactory and efficient results.

For handling dry sand and gravel, a Monighan walking-dragline excavator with a 3½-cu. yd. bucket has been provided, powered with a 150-hp. type H Fairbanks-Morse motor.

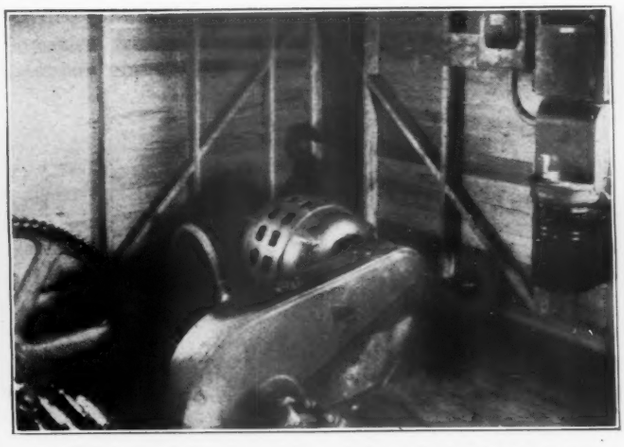
Water for the washing plant is supplied by an 8-in. Fairbanks-Morse pump direct-connected to a Fairbanks-Morse motor, located in a small sheet-iron building at the water's edge.

Another interesting installation is a 15-hp. Fairbanks-Morse motor operating an ingenious car puller which was built up from second-hand rotary-rig hoisting drums. By the use of two jack-shafts and roller chain and spur-gear reductions this unit is able to move cars in either direction to any of the tracks in the plant.

An auxiliary to the dredge that is very interesting is a 2-in. pump. The gravel in this deposit is overlain with about 4 ft. of sand, and considerable trouble was experienced due to the fact that the



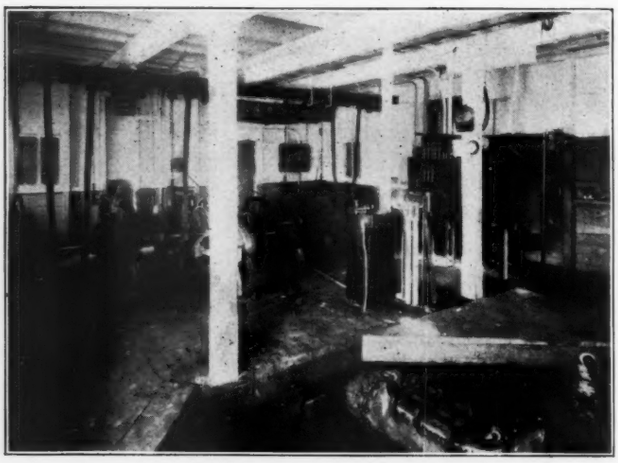
Dredge pump and 500-hp. motor.



Motor driving bucket elevator through silent chain.

Excavator moving parts are well protected against sand and grit.

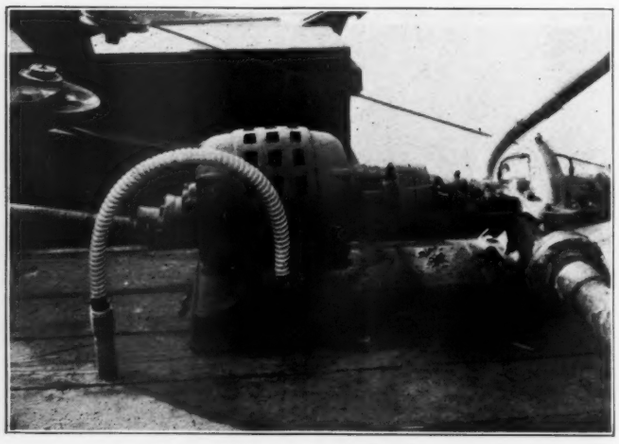
sand caved in around the suction nozzle in great quantities and choked the pump. This small pump discharges a jet of water through an ordinary fire nozzle into the sand bank, working it down grad-



View of hoisting room on dredge.

ually to the pump suction, thus preventing caving in large lumps.

Before the new plant was installed, a washing plant, fed by a Sauerman hoist and dragline excavator was operated satisfactorily. The Sauerman hoist was equipped with a 125-hp., variable-speed



Motor-driven pump supplying water for sluicing sand.

Fairbanks-Morse motor, which drove through a long chain drive. This washing plant was supplied with water from an Amsco centrifugal pump direct-connected to a 40-hp. Fairbanks-Morse motor.

Twenty-two electric motors, ranging from 1 hp. to 500 hp., are used in the plant. As on the dredge, all are Fairbanks-Morse make, with ball-bearing drives. This ball-bearing installation on all motors was made necessary, due to high operating speeds and the constant presence of grit and moisture. The remaining portions of the plant and equipment were supplied by the Link-Belt Company.

The new plant has been in operation since July, 1929. O. J. Carter is superintendent of the plant. The executive personnel of the company is Captain W. D. Haden, president; W. A. Wansley, vice-president; E. D. Haden, treasurer; C. R. Haden, secretary. M. Sid Clark is general sales manager of the company.

Exports of Mining and Quarrying Machinery Set Record

The greatest volume of mining and quarrying machinery in history was exported by the United States during the past year, according to the Industrial Machinery Division, Department of Commerce. The total value reached was $17,953,877, as compared with $14,059,592 in 1928.

Europe absorbed the largest portion of these shipments, with a total value of $4,430,000, Soviet Russia in Europe, the United Kingdom, Spain and France being the principal customers in this area.

Excavators and power shovels, dredges, air compressors, however, are not included in the above total.

South America purchased the next largest amount, valued at $3,843,000, closely followed by Canada, Newfoundland, etc., with purchases valued at $3,834,000, and Mexico and Central America with $1,975,000 (of which Mexico purchased all but $118,000 worth), Africa $1,803,000 and Asia $1,374,000.

The Canadian market has been growing steadily over a considerable period and has held first place as an outlet for American mining and quarrying machinery ever since it assumed this position in 1927, when Mexico dropped to second place. In 1929 Canada expended $3,726,000 for these products, representing a gain of 36 per cent over the purchases of the previous year.

South Africa purchased a record volume of mining machinery in 1929, slightly exceeding the previous peak year, 1927. Considerable equipment entering into this trade was probably destined for the increasingly-active asbestos mines in South Africa.

Exports to Soviet Russia in Europe were only slightly less than the record volume of 1928. This trade has, in recent years, been stimulated by Russia's ambitious industrial plans.

Co-operation of All Workmen Necessary in Preventing Yard Accidents*

By A. K. FROLICH
Superintendent, Ash Grove Lime & Portland Cement Co., Louisville, Neb.

DURING the past few years the safety-first movement has been answered throughout the country by an enthusiastic response from the majority of leading industries. Not until recently has it been realized that industrial accidents are usually the direct result of human ignorance, indifference, carelessness, or willful neglect of the fundamental rules of safety. The mental attitude of the man exposed to hazard is highly important and it is indisputably the duty of the employer to develop in the worker, where necessary, a sense of individual responsibility in the prevention of accidents to himself or his fellow workers.

We should try to develop in the mind of each individual an interest in co-operation and preparation against any tragic incident that might happen to him or his fellow workers as a result of his lack of safety education. I believe that we, as interested safety leaders, should devote a portion of our daily time to forewarning our employees and bringing them to a realization of how essential it is to the happiness and security of themselves and their families that they shall have whole bodies. They may be performing seemingly hazardous work daily and coming through without a scratch, but without an education in safety first rules they are gambling with their lives, their homes, and their families.—A. K. Frolich.

The yard is probably one of the most dangerous departments. This is due, partly, to the large number of railroad tracks that are necessary economically to carry on manufacturing and shipping activities. All cement plants have tracks running through their yards, and it is only human nature to consider these tracks a substitute for sidewalks, although walks are often provided in convenient locations. When the latter is not the case, it would be good policy to provide walks in the most practical locations in order to lessen the temptation to consider tracks as walkways. In addition to this, walks should be properly maintained the year round and kept free from ice and snow—this will make them even more attractive for use.

Experience has proved that the safety sign is a valuable asset, especially in the yards where dangerous hazards exist. A warning sign can properly be placed in alleys running between buildings that open onto railroad tracks. Recently, it happened that I passed through an alley-way of this kind and found a track gang using the warning sign as a clothes rack for their coats!

When cars, whether empty or loaded, are spotted on elevated tracks, caution should be exercised to make sure that the brakes are set securely, and the wheels blocked. It is not good practice to depend on the railroad crews to do this.

At our Louisville plant, two men are employed to let railroad cars down an incline by gravity; one man being on top of the car near the brake, and the other alongside ready to block the wheels. The man on the side carries a whistle and is required to blow it at every alley way. The men are also requested not to allow the moving car to bump against other cars located on the tracks unless it positively cannot be avoided.

An accident which happened at our plant will serve to illustrate this point:

A railroad car with defective brakes, being dropped down a slight incline, was allowed to strike an empty car which was, at the time, being cleaned for loading. The car cleaner was, of course, knocked down and the accident might have resulted in serious injury.

It is quite essential that every plant have a definite understanding with the railroad companies that they shall not make "flying switches" inside the plant yards.

One of the most foolish cases I ever heard of was related in a safety talk at one of our recent mass meetings. This incident concerned three men who were working on the outskirts of a plant when it began to rain. They first visited a neighbor's watermelon patch, then took shelter under a nearby railroad car, which happened to be the last car of a long train. So busily were they engaged in devouring the watermelons that they failed to notice that an engine had been coupled on at the farther end. As a result, one man was killed and another permanently disabled.

Loading runways or planks used for loading or unloading cars should never be left extending from car doors when work is left temporarily unfinished or completed, and should always be removed before cars are switched. All such runways should be removed before quitting time in the evening, so that, if a switch engine moves the cars, equipment will not be damaged nor men injured. Also, in case of fire, it might be necessary for men to run between cars which would be very dangerous.

When unloading box cars, material should never be thrown out without having a guard outside. I

* Read at Portland Cement Association regional safety meeting held at Kansas City, Mo., March 25, 1930.

have seen several accidents which occurred while unloading railroad ties because the outside was not guarded.

Grading along and between tracks, where switchmen may pass frequently, should be leveled with shoulders of ample width, and the ballast should not be of too coarse material.

Locomotive cranes, which are extensively used in many plants, present other yard hazards. Definite rules should be adopted not to walk under the boom or bucket of the crane, whether it is in operation or at rest. Care should be taken when swinging cranes, to assure that loads or loose slings do not strike anyone passing by.

Great care should be used in making fastenings, when material is handled with cranes or other power devices, to prevent slings or hooks from slipping or coming loose.

The bucket should always be lowered to the ground, when a crane is out of service for any length of time, or at quitting time.

Signs should be placed at both ends, some distance away, when a crane, or switch locomotive, is under repair, and the machine should in such cases be well blocked.

Speed limits should be established and maintained prohibiting automotive vehicles from speeding through the yards.

Good housekeeping in the yard plays an important part in the prevention of accidents, as well as being an essential factor in adding to the attractiveness of the plant. Special locations should be provided for rubbish and others for scrap material which can be trucked away at regular times, before a great amount has accumulated. Weeds should not be allowed to grow in yards to an excessive height as they provide an excellent place to throw waste, and when they dry out in the fall, they also create a very dangerous fire hazard.

Excavation for ditches and sewers should never be attempted by one man. It is considered a good investment to have not less than two experienced men engaged in this kind of work, and they should be instructed to use their best judgment toward preventing a cave in and to use cribbing when necessary. When work is left unfinished at the close of the day, a railing should be installed around the excavation supporting a sufficient number of red warning lights.

I heard the other day, from a telephone and telegraph company, that their accident-experience figures showed 14 times as many accidents caused by post holes, as by post and line work.

We have, at Louisville, adopted the practice of using a light pipe railing around manholes for sewer, water or underground cable ducts, when a cover is removed. One man can easily carry this safeguard from one place to another.

The railroad companies have an active rule regarding a minimum distance between center of tracks and other obstructions. This rule can and should be observed by plants operating industrial tracks where the railroad engines do not switch.

Electric wiring should not be allowed, even temporarily, to be strung over the ground.

Construction jobs should be cleared regularly, and especially when concrete forms have been taken down. The lumber should be piled in an orderly way, and no boards or lumber pieces should be allowed to lie about with nails exposed.

A common practice in many plants is to start new men in the yard department and, at a later date, pick out the best ones for operators or other jobs. All new men should be thoroughly instructed as to the hazards of their jobs, as it is important that they get the safety habit from the very first.

My experience is that a regular yard man temporarily employed in a mill department is usually a safe worker, as he is somewhat frightened and feels that everyone is watching him. While only a few men are usually exposed to the hazards peculiar to the different departments, the whole organization is exposed to the yard hazards, and for this reason yard safety rules should be strictly enforced.

The foreman should be held responsible for such hazards as snowy roofs, icicles, unnecessary cluttering up of material in yards, and other miscellaneous hazards.

Most accident-prevention campaigns stress the hazards around machinery. I believe, however, that the yard operations involve far more dangerous activities than machinery. I base my statement upon the theory that manufacturers are constantly introducing safety devices, and continually cautioning their workmen regarding machine accidents, but neglect to stress yard hazards. In a report made by the Industrial Commission of Wisconsin, the statement is made:

"We must conclude that the great majority of accidents are not preventable by guards. If every danger point on every machine were perfectly guarded, making accidents impossible, then we would have eliminated just about one-fourth of all accidents."

Preach safety first to the foremen and men all the time, and get the employees so interested that they will take their safety-first and accident-prevention ideas to their homes. We will then have a first-class organization of safety workers who have practiced safety in their homes, and have secured the interest of their wives and children in this movement.

I heard Sir Baden Powell's Boy Scout message over the radio a couple of weeks ago, and there was one interesting statement he made. He said, "We cannot win by dollars, but by co-operation." This applies also to our accident-prevention work—let us educate ourselves and our fellow employees in co-operation.

MEN OF THE INDUSTRY

The portrait printed on this page in each number of PIT AND QUARRY is selected without significance as to current events or the position of the individual in the industry.

G. O. GARDNER

Superintendent,
Ash Grove Lime & Portland Cement Co.
Chanute, Kan.

Personal Mention

Bert Lueck suffered painful burns about his face, neck and left wrist recently at the Alpena, Mich., plant of the Huron Portland Cement Co. when an acetylene torch, with which he had been working, exploded. He was taken to the office of a physician who dressed the burns.

S. O. Trest, general manager of the American Sand & Gravel Co., of Hattiesburg, Miss., is now also president of the company. **W. B. Thigpen** is sales manager, and **Herbert Gillis** is secretary-treasurer.

R. B. Crenshaw has been named sales representative in the Chicago district for the Universal Power Shovel Co. Division of the Unit Corporation of America, Milwaukee, Wis.

Mr. Crenshaw is a "shovel" man of long practical experience, having been for nine years district manager for the McMyler Interstate Co., old-time manufacturers of material handling equipment. For the last two years he has had charge of the Detroit territory for the Ohio Locomotive Crane Co. of Bucyrus, O.

Francis A. Emmons, sales manager of Foote Bros. Gear & Machine Co., has been elected vice-president in charge of sales and advertising of gear division sales. Mr. Emmons started with Foote Bros. in 1924 as advertising manager, and was appointed sales manager in 1926.

Ervin G. Bailey, president of the Bailey Meter Co., Cleveland, O., and a widely known engineer, was awarded the Edward Longstreth medal by the Institute at the Medal Day exercises held May 21, 1930, in the hall of the Franklin Institute at Philadelphia, Pa. Mr. Bailey received the medal upon the recommendation of the Institute's Committee on Science and Arts, in recognition of his many inventions and developments of regulating and controlling devices, and of measuring and recording instruments. Mr. Bailey, who was graduated in mechanical engineering from Ohio State University Class of 1903, is an inventor of note, holding many patents on instruments and equipment used in the combustion field. He is a resident of Easton, Pa., and is also president of the Fuller Lehigh Co. at Fullerton, Pa., and a director of the Babcock & Wilcox Co. of New York, N. Y.

William E. Balliet has succeeded P. V. Kelly as manager of the Birmingham office of the Blaw-Knox Co., Brown-Marx Bldg., Birmingham, Ala. **Joseph Riley** will become assistant manager of the district.

Robert R. Litehiser, of Columbus, Ohio, who has been manager of the Columbus, O., district office of the Portland Cement Association, has been named road-test engineer of the Ohio Department of Highways to fill the vacancy caused by the death of **A. S. Rea.**

W. R. Bennett, engineer assistant to **J. E. Taussig**, president of the Wabash Railway, has been appointed chief engineer of the maintenance-of-way department.

Fred C. Barkhurst, of McConnellsvills, O., has been named a division engineer in the Ohio Highway Department to succeed **R. E. Bischoff**, resigned.

H. F. Clemmer, technical adviser for the Solvay Process Co., has resigned his position to become engineer of tests and materials of the engineering department of the District of Columbia.

Chad F. Calhoun, formerly engineer for Fisher-Ross-MacDonald & Kahn, Inc., contractor for the San Gabriel Dam, Los Angeles County, Cal., has been made general manager and chief engineer of that firm.

James D. Sisler, formerly associate geologst of Pennsylvania, has been appointed geologist of the state of West Virginia, with headquarters at Morgantown, W. Va.

R. E. Haire, president of Gypsum, Lime & Alabastine, Ltd., Paris, Ont., Canada, has sailed for London, England, to be gone several months. While in England, Mr. Haire will arrange for the establishment of a plant and office there.

N. E. Kelb, of Indianapolis, Ind., has been appointed as agent in the Hoosier state for the Erie Stone Co., an affiliate of the France Stone Co., Toledo, O.

Lewis Spinks has been appointed vice-president of the Raritan River Sand Co., Nixon, N. J., following the recent withdrawal of **C. E.** and **J. B. Dalrymple** as members of the firm. The Dalrymples recently formed the Dalrymple Sand & Gravel Co. at New Brunswick, N. J.

James C. Dick, former silica sand producer at Polk, Pa., has formed the J. C. Dick Silica Sand Co., the plant being located at Falls Creek, Pa.

John E. Chiquoine has joined the sales staff of the Blaw-Knox Co., Pittsburgh, Pa. Mr. Chiquoine has been connected successively with the American Chemical Machinery Co., of which he was chief engineer, and with the industrial engineering division of E. I. Du Pont de Nemours & Co.

Guiseppe Faccioli, widely-known electrical engineer, has retired from active participation in the affairs of the General Electric Co., because of ill health. Mr. Faccioli has relinquished his duties as Pittsfield works engineer and associate manager of the Pittsfield works of the company and assumed the position of consulting engineer. At present his health is such that he is unable to walk although he motors to his office almost daily. Announcement of Mr. Faccioli's retirement was made by **C. C. Chesney**, vice-president of the company and his close associate for 25 years.

E. A. Kingsley has been appointed consulting engineer of Oklahoma City, Okla. Mr. Kingsley was formerly city engineer at Dallas, Tex., and Little Rock, Ark., and at one time was highway engineer of Arkansas.

Obituary

H. C. Milnor, founder of the H. C. Milnor Sand Co. of Knoxville, Tenn., died May 29 at Knoxville. He was 72 years old and had been in poor health since last autumn.

Mr. Milnor organized the sand-and-gravel company which bore his name 38 years ago and was actively engaged in it until the time of his last illness. The business is now operated by his son.

Surviving are one daughter, one son and one sister. Funeral services were held at the home Friday, May 31.

Patrick J. Morrissey, former general superintendent of Cleveland Quarries, Inc., is dead at his home in Berea, O. Mr. Morrissey was 79 years of age at the time of his death.

G. S. Busboom, 32, president of the Carthage Marble Corp., Carthage, Mo., met death recently in an airplane crash near Tulsa, Okla.

Paul C. Buechner, vice-president, secretary and operating manager, Crossman Co., South Amboy, N. J., died on May 17, 1930.

William H. Adey, of Cohoes, N. Y., died recently at the age of 58. Mr. Adey had been a civil engineer in the employ of the Delaware & Hudson Co. for 30 years and had charge of some of the company's large construction work.

P. H. Everett, senior highway engineer of the U. S. Bureau of Public Roads, was killed in an automobile accident near Round Rock, Tex., recently.

Noah Speer, 93, died recently at his home in Berkeley Springs, W. Va. Mr. Speer was a pioneer glass-sand technician and for years maintained offices and a laboratory at Pittsburgh, Pa.

Coming Events

June 16-25, 1930. Berlin, Germany. World Power Conference. World Power Conference Program Committee, Room 818, 29 W. 39th St., New York, N. Y.

June 23-27, 1930. Atlantic City, N. J. Annual Meeting, American Society for Testing Materials.

June 24, 1930. Cleveland, O. Portland Cement Association regional safety meeting, at Hotel Cleveland. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

June 26, 1930. Washington, D. C. Portland Cement Association regional safety meeting, at Hotel Raleigh. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

July 1, 1930. Detroit, Mich. Portland Cement Association regional safety meeting, at Book-Cadillac Hotel. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

July 2-10, 1930. Scarborough, England. Exhibition of Quarrying and Building Contractors' machinery and materials. Exhibition Organizers, 53 Broad St., Birmingham, England.

July 10, 1930. Pittsburgh, Pa. Organization meeting, National Ready-Mixed Concrete Assn. V. P. Ahearn, executive secretary, National Sand & Gravel Assn., Munsey Bldg., Washington, D. C.

July 29, 1930. Austin, Tex. Annual meeting, Texas Sand and Gravel Producers' Assn. Austin Hotel. W. W. Carson, executive engineer, Littlefield Bldg., Austin, Tex.

Sept. 9, 1930. Seattle, Wash. Portland Cement Association regional safety meeting, at New Washington Hotel. A. J. R. Curtis secretary, 33 W. Grand Ave., Chicago, Ill.

Sept. 16, 1930. San Francisco, Cal. Portland Cement Association regional safety meeting, at St. Francis Hotel. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

Sept. 23, 1930. Ogden, Utah. Portland Cement Association regional safety meeting. Hotel Bigelow. A. J. R. Curtis, secretary, 33 W. Grand Ave., Chicago, Ill.

Sept. 29-Oct. 3, 1930, Pittsburgh, Pa. Annual congress and exposition. National Safety Council, William Penn Hotel. W. H. Cameron, managing director, 20 N. Wacker Drive, Chicago.

Oct. 6, 1930. Washington, D. C. Sixth International Road Congress under auspices American Road Builders' Assn. Charles Upham, engineer-director, National Press Bldg., Washington, D. C.

Oct. 7-10, 1930. Washington, D. C. Sixth International Road Congress under auspices American Road Builders' Assn. Charles Upham, engineer-director, National Press Bldg., Washington, D. C.

Dec. 1-6, 1930. New York, N. Y. National Power Show, Grand Central Palace.

Jan. 27-29, 1931. St. Louis, Mo. Annual convention National Sand & Gravel Assn., Hotel Jefferson. V. P. Ahearn, executive secretary, Washington, D. C.

A Practical Quarryman's Suggestion for Research in Explosives

By L. B. REIFSNEIDER
Quarry Superintendent, Cumberland Portland Cement Co., Cowan, Tenn.

IN SPITE of the long strides made by the various manufacturers of explosives toward making high explosives safer to handle, premature explosions, frequently of unknown origin and usually accompanied by loss of life, are reported with regrettable frequency.

Chemists tell us that the reason high explosives explode, is the unbalancing or changing the form of the chemicals used in their manufacture, and that this unbalancing or changing may be brought about by several methods. The method with which the ordinary blaster is most familiar is detonation by means of a blasting cap, Cordeau or some other form of detonating agent which produces heat, concussion and combustion. Another method of causing detonation with which the ordinary blaster is less familiar, but which is familiar to and avoided by every chemist, is by changing the proportion of the different chemicals used in the mix which makes up the explosive compound.

It is a well-known fact that while all the high explosives in common use are based on certain elementary principles of chemistry, yet each manufacturer has certain formulæ to which he adheres and as long as these formulæ remain unchanged the user is afforded a reasonable margin of safety. It is quite unlikely that the formulæ of any two manufacturers correspond even in explosives of the same grade and type.

These facts are generally known among men who make a special study of explosives and their action and use but, to the ordinary user, 40 per cent dynamite is 40 per cent dynamite, no matter by whom manufactured or what its chemical composition. And it is not at all unusual to find two or more brands or types of dynamite of the same or different strength ratings, but manufactured by different companies under entirely different formulæ, being used on the same job and not infrequently in the same blast hole.

Given this condition, plus the fact that it is customary to slit the coverings of cartridges when loading and in some places even to remove the wrapper entirely, shucking the powder into holes which are frequently ragged and irregular and afterward compact it thoroughly with a rammer, an excellent opportunity is afforded to make an intimate mixture and also an ideal condition for the unbalancing of the chemical elements with possible disastrous consequences.

If such a thing is possible, and the idea does not seem to be too far fetched, then two or three comparatively recent premature explosions which have seemed unaccountaable, may be readily explained.

Aside from the economic feature, it would seem questionable whether the ordinary user of explosives is ever justified in mixing several types of explosives in the same bore hole, except on the advice of some person thoroughly familiar with the different explosives used and the possible result of the chemical reactions which may result from combining them.

But little information is available to the every-day blaster on the ideas advanced above and it is believed that a wide field for investigation is open along these lines. Should such investigation prove that there is danger in the practice, the sooner such information can be made public through every manufacturing and safety organization the better it will be for the manufacturer and the consumer.

Foote Bros. Co. Elects Additional Executives

At a recent directors' meeting the following additional officers of Foote Bros. Gear & Machine Co., Chicago, Ill., were elected:

C. C. Commons, first vice-president and assistant secretary; F. A. Emmons, vice-president in charge of gear and reducer sales and advertising; H. H. Bates, vice-president in charge of the road machinery division; W. A. Barr, vice-president in charge of manufacturing; W. J. Heineman and W. O. Bates, Jr., assistant vice-presidents.

Industrial Health and Inspection—Timely Topics for August Safety Meetings

By W. DEAN KEEFER
Director, Industrial Safety Division, National Safety Council

OUR suggested program for your August safety meeting includes two important topics —the one relating to industrial health and the other relating to safety inspections.

During recent years there has been increasing interest in the subject of industrial health. Health practices are known to have a close relationship to personal efficiency and also to accident prevention. One of the chief objects of a plant health department should be the prevention of lost time from sickness, which really means the prevention of sickness.

Preventive medicine is making rapid progress in industrial plants. Medical departments usually give much attention to this phase of health service, and plant officials are interested because such a program in a plant always results in the reduction of absence from work. For the best results in preventive medicine it is necessary that the doctor or the nurse get out into the plant and observe actual conditions. Such impressions will make possible not only the better treatment of injuries and sickness, but also a closer cooperation with the operating and safety departments of the plant for the maintenance of more healthful working conditions. The maintenance of a high degree of healthfulness in plant conditions is now recognized by many executives as an indispensable feature of industrial operations.

In planning the program for your August safety meeting, the chairman of your safety committee should arrange with the company physician or surgeon, or one of the local doctors who does a considerable portion of the company's medical work, for a special address.

It is suggested that the speaker might discuss briefly one or more of the following topics:

1. The purpose and the value of physical examinations.
2. The value of assigning jobs in the industry from the viewpoint of accident prevention.
3. How the doctor can help to prevent lost time due to personal injuries.
4. How the safety committee can help the doctor in caring for injured workers.
5. What the doctor saw in an inspection trip through our plant.
6. The value to the individual of regular physical examinations.
7. Why the doctor should have a detailed report of the accident.
8. How the foreman can detect signs of illness among his workers.

The second topic which is suggested —safety inspections—is also an important one. The value and the need of regular safety inspections is realized by all. It is advisable to have, from time to time, a sub-committee of the entire safety committee make a complete safety inspection of one or more departments or of the plant.

For instance, a sub-committee might be asked to inspect your machine shop several days before your August safety meeting. A report of this inspection could then be presented and discussed in detail at the meeting. Like inspections could be made previous to other meetings relating to such plant divisions as transportation, mill operations, quarry and the like.

The foremen of these different plant divisions might be made members of the inspection committee. Or a general committee might be appointed to make the inspection entirely independent of all department foremen.

The inspection committee might look primarily for unsafe practices. On the other hand, it might also look for hazards of a mechanical or physical nature.

If an inspection is made of the machine shop, the committee should look for information to answer such questions as the following:

1. Are the floors in good condition?
2. Are the aisles properly maintained?
3. Is the electrical equipment safe?
4. Are trucks, cranes and other equipment in good condition?
5. Are machine and transmission belts, pulleys, flywheels, etc., guarded?
6. Are any guards not in use?
7. Are goggles worn by the workers who should wear them?
8. Is there any horse-play among the workers?
9. Do men use suitable brushes to remove hot and sharp chips from machines?
10. Are any unsafe tools in use?
11. Do workers wear safe clothing and shoes?
12. Are gloves worn on jobs where gloves increase the accident hazards?

Some of the above questions would apply equally well to other departments to be inspected in succeeding months.

At this meeting, or another like meeting, the plant safety engineer might be asked to make a general talk. This might include an outline of the accident experience of the company. He might compare the accident frequency and severity rates of the plant with the rates of other companies of similar size. For example, such comparative records could be secured from the accident records of the National Safety Council.

The speaker also might give the safety record of each department of the plant emphasizing the fact that the report of each department shows the experience of that department as compared with its own previous record.

He could also point out the effects that accidents have in increasing the labor turnover of the plant, in decreasing plant production, in lowering the personal efficiency of employees, in increasing plant spoilage, and in relation to damage to machinery and equipment.

Financial News

The information contained in these financial pages is given with the understanding that any statement on the part of this magazine or any of its staff, as to the responsibility or standing of any person, firm or corporation, or as to the value of any property or securities is a mere expression of opinion, given as a matter of service to the readers of PIT AND QUARRY, *for which no responsibility in any way is to attach to this magazine or to any of its staff.*

International Salt Co. to Split Stock 3 for 1

Directors of the International Salt Co. have voted, subject to approval of stockholders on June 17, to issue, as of that date, three new no-par shares in exchange for each old $100-par share, and to offer shareholders the right to purchase additional new no-par stock at $36 per share, in the ratio of one share for each three new no-par shares held.

Dividends, which have been paid at the rate of $6 annually, have been increased by the declaration of a $2 quarterly disbursement, payable July 1, 1930, to holders of record June 16. It is probable that the proposed financing, following the split-up, is to reimburse the company for its recent purchase of Sterling Salt Co. for $2,000,000. As last reported, International Salt had outstanding 60,711 shares, which would be increased to 182,313 shares by the split-up, and by an additional 60,771 shares if the rights are fully subscribed, bringing the total number of shares outstanding to 243,084, after completion of the proposed plan. Earnings in 1929 amounted to $11.32 on the present stock, and $7.23 per share in 1928. These earnings, adjusted to the proposed changes and financing, would have been equivalent to $2.83 in 1929 and $1.81 in 1928.

Superior Cement Stock, Surplus Show Decrease

The Superior Portland Cement Co., which does not report income statements, has recently published its annual balance sheet for the end of 1929. As of December 31, 1929, total resources amounted to $6,735,000; land, buildings, and equipment were valued at $5,404,000, as compared with $5,575,000 at the close of 1928. Capital stock and surplus were carried at $6,531,000, a decline of $204,000 for the year, indicating that a loss was sustained after dividend payments. Investments of $674,000 showed a decline of $98,000 and current assets of $489,000, including $77,000 cash, compared with current liabilities of $153,000.

The Superior plant, which has an annual capacity of 2,000,000 bbl., is located at Concrete, Wash. Adjacent to the plant are the company's limerock properties and power plant.

Bessemer Limestone and Cement's Earnings Lower

Net profit of Bessemer Limestone & Cement Co. for the year ended December 31, 1929 was $341,683 after depletion, depreciation, interest, federal taxes, etc., against $543,302 in 1928. In 1929 dividends paid on 50,000 shares of Class A stock amounted to $150,000 and on Class B stock to $100,000, against same amount on Class A shares and $250,000 on Class B shares in the preceding year. According to the statement of L. A. Beeghley, president, decline in selling prices and in volume of building construction reduced 1929 earnings.

No Gain in Net Income by Pennsylvania-Dixie

Pennsylvania Dixie Cement Corp., which has not issued a quarterly report, reported, however, for the twelve months ended March 31, 1930. In this period an operating income of $2,479,723 was shown, and net income, after depreciation, depletion, interest, and federal taxes of $329,136, equivalent to $2.42 per share of $7 preferred stock, and nil on the common stock. Interest charges were earned 1.55 times. These earnings compare with a net profit of $332,000 earned in the twelve-months period ended December 1, 1929.

The company's consolidated balance sheet of March 31, 1930, showed total current assets of $5,642,000; including cash of $1,852,000, and inventories of $3,136,000, compared with current liabilities of only $459,648.

N. Y. Trap Rock Reports Upward Trend in Income

New York Trap Rock Corp. recently published its report for the year 1929 showing continuance of the upward trend in earnings evidenced since 1924. For the year ended December 31, 1929, gross profit of $3,423,000 and a net income of $1,990,000 were reported, as compared with corresponding figures of $3,076,000 and $1,599,000, respectively, reported in the previous fiscal period. Per-share earnings were $99.50 on the $7 preferred stock, and $10.28 on the common stock, compared with $79.95 and $8.10 earned, respectively, on the two classes of stock in 1928.

These per-share earnings were based on 20,000 shares preferred and 180,000 common shares in both years. The common stock is currently on a $3-dividend basis.

The company supplies a considerable proportion of the crushed stone used in New York and adjacent territory from its quarries on the Hudson River between Newburgh and Poughkeepsie, a short distance below Peekskill, and at Haverstraw, N. Y. Other quarries are located elsewhere in New York and Connecticut.

The company's balance sheet, as of December 31, 1929, showed a strong treasury position, with current assets of $3,709,000, including cash of $1,283,000, compared with current liabilities of $1,336,000. Net fixed assets were carried at $16,283,000, as compared with $15,978,000 at the end of 1928.

Asbestos Corp., Ltd. to Vote to Delay Payments

Asbestos Corp., Ltd., has called a meeting of general mortgage bondholders for June 30, 1930, to approve proposal for the postponement of interest payments on bonds until January 1, 1932. Bondholders will vote on proposal to defer payment of sinking fund installment due January 1, 1931, to January 1, 1933.

CURRENT DIVIDENDS

COMPANY	CLASS OF STOCK	DIVIDEND RATE	HOLDERS OF RECORD	PAYABLE	COMPANY	CLASS OF STOCK	DIVIDEND RATE	HOLDERS OF RECORD	PAYABLE
Canada Cement	Preferred	1¾% qr.	May 28	June 30	Metropolitan Paving Brick	Preferred	$1.75 qr.	June 15	July 1
Cleveland Builders Supply	Common	$.50 qr.	June 15	July 1	Newago Portland Cement	Preferred	$1.75 qr.	June 26	June 30
Consumers Co	Pr. Pfd.	$1.50 qr.	June 15	July 1	New York Trap Rock	Preferred	$1.75 qr.	June 20	July 1
International Cement	Common	$1.00 qr.	June 11	June 30	Peerless Cement	Preferred	$1.75 qr.	June 20	June 30
Johns Manville	Preferred	$1.75 qr.	June 11	July 1	Texas Gulf Sulphur	.....	$1.00 qr.	June 3	June 15
Johns Manville	Common	$.75 qr.	June 25	July 15	United States Gypsum	Preferred	$1.75 qr.	June 15	June 30
International Salt	Common	$2.00	June 16	July 1	United States Gypsum	Common	$.40 qr.	June 15	June 30
Lawrence Portland Cement	.....	1% qr.	June 14	June 30					

Traffic News and Comment

High Court Interprets Hoch-Smith Resolution

On Monday, June 2, the Supreme Court of the United States rendered a decision interpreting the Hoch-Smith resolution which was carried up to it as a result of formal complaint filed with the Interstate Commerce Commission by the California Growers' and Shippers' protective league, and as a result of the Interstate Commerce decisions therein.

On January 30, 1925, Congress passed a joint resolution known as the Hoch-Smith resolution. That resolution read as follows:

"That it is hereby declared to be the true policy in rate making to be pursued by the Interstate Commerce Commission in adjusting freight rates, that the conditions which at any given time prevail in our several industries should be considered in so far as it is legally possible to do so, to the end that commodities may freely move.

"That the Interstate Commerce Commission is authorized and directed to make a thorough investigation of the rate structure of common carriers subject to the interstate commerce act, in order to determine to what extent and in what manner existing rates and charges may be unjust, unreasonable, unjustly discriminatory, or unduly preferential, thereby imposing undue burdens, or giving undue advantage as between the various localities and parts of the country, the various classes of traffic, and the various classes and kinds of commodities, and to make, in accordance with law, such changes, adjustments and redistribution of rates and charges as may be found necessary to correct any defects so found to exist. In making any such change, adjustment, or redistribution the commission shall give due regard, among other factors, to the general and comparative levels in market value of the various classes and kinds of commodities as indicated over a reasonable period of years, to a natural and proper development of the country as a whole, and to the maintenance of an adequate system of transportation. In the progress of such investigation the commission shall, from time to time, and as expeditiously as possible, make such decisions and orders as it may find to be necessary or appropriate upon the record then made in order to place the rates upon designated classes of traffic upon a just and reasonable basis with relation to other rates. Such investigation shall be conducted with due regard to other investigations or proceedings affecting rate adjustments which may be pending before the commission.

"In view of the existing depression in agriculture, the commission is hereby directed to effect with the least practicable delay such lawful changes in the rate structure of the country as will promote the freedom of movement by common carriers of the products of agriculture affected by that depression, including livestock, at the lowest possible lawful rates compatible with the maintenance of adequate transportation service; Provided, That no investigation or proceeding resulting from the adoption of this resolution shall be permitted to delay the decision of cases now pending before the commission involving rates on products of agriculture, and that such cases shall be decided in accordance with this resolution."

It is contended that the Interstate Commerce Commission based its order in the California Growers' and Shippers' Protective League entirely upon the joint resolution and that no great reliance was placed upon the allegation of the complaint, for in a previous proceeding between the same parties the Commission found the same rates neither unreasonable nor unduly preferential and sustained them as lawful rates. Accordingly the proceeding was carried to the Supreme Court of the United States, and in its decision the Court held that the Hoch-Smith resolution does not purport to make any change in the existing law, but, on the contrary, requires that the existing law be given effect. The court also stated that it does not purport to make unlawful any rate which, under the existing law, is a lawful rate, but, on the contrary, leaves the validity of the rate to be adjusted by the law.

In other words, the Hoch-Smith resolution is more in the nature of a hopeful characterization of an object deemed desirable if, and in so far as, it may be attainable, than of a rule intended to control rate making.

The resolution was directed by Congress to a depression in agriculture, but under the Court's decision there is no basis for making a change in rates unless the existing rates are unlawful and in violation of the act to regulate commerce, and the Court states that the Commission bases the California decision upon an erroneous construction of the joint resolution.

Uniform Bill-of-Lading Forms in Effect Aug. 1

The new contract terms and conditions of the Uniform Bill of Lading have been published in Supplement No. 1 to Consolidated Freight Classification No. 6, filed to become effective August 1, 1930. The Western Classification Committee has issued its circular of June 1, 1930, reading as follows:

"Changes in the Interstate Commerce Act have made it necessary to revise the forms of domestic bills of lading and live-stock contract prescribed by the Commission in Docket No. 4844 as now published in Consolidated Freight Classification No. 5.

"The revised forms of bills of lading and live-stock contract effective August 1, 1930, are shown in Supplement No. 1 to Consolidated Classification No. 6.

"Shippers preparing their individual forms must follow the set up shown in Supplement No. 1 and provide exact reproduction of contract terms and conditions on the reverse side.

"The standard size, 8½ in. by 11 in., should be observed wherever possible, but in no instance may forms be less than 8½ in. wide.

"Although the changes made by Congress have been generally known or anticipated, it is appreciated that shippers may have on hand a supply of the present forms of domestic bills of lading and, in order to avoid economic waste and to provide ample time for securing supplies of new forms, the old forms may be used to December 31, 1930, provided they are stamped in legible type with the following notation to be signed as indicated below:

"This shipment is tendered and received subject to the terms and conditions of the company's uniform bill of lading, effective August 1, 1930. This receipt is *not negotiable*, and if the shipment is consigned 'To Order' must be exchanged for Company's Uniform Bill of Lading."

. . . . . .
Shipper's Signature.

. . . . . .
Agent's Signature.

On and after January 1, 1931, the new forms of bills of lading must be used.

The Official and Southern Classification Committees will adopt the same rule.

Polyhalite an Important Domestic Potash Source

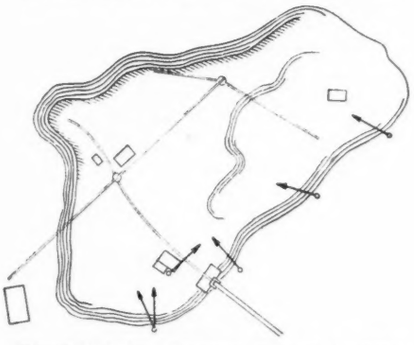
The mineral polyhalite promises to become an important factor in the growth of the American potash industry, according to the United States Bureau of Mines. Deposits of this potash-containing mineral have been found in Texas and New Mexico, in the course of the government drilling program, in quantities sufficient for profitable commercial development, provided fairly inexpensive chemical processes for the extraction of the potash salts can be devised. The solution of this problem seems assured as the result of investigative work being conducted at the Non-metallic Minerals Experiment Station of the Bureau of Mines, New Brunswick, N. J.

Polyhalite in contact with water breaks down into its constituents; the sulphates of potash and magnesia go readily into solution, leaving a surface coating of gypsum on the polyhalite particles that partly protects them from further attack by the solvent and retards the rate of solution. In a large excess of water this gypsum will also be slowly dissolved. The fineness of the material and the relative amount of water used are factors in the rate of solution. Experiments at the New Brunswick station of the Bureau of Mines with polyhalite from a test well in New Mexico show that, using 4 parts of water to 1 part of polyhalite at ordinary room temperatures (21 deg. C.), the potash minerals will all pass into solution.

Review of Foreign Practice

Flood Lights in German Quarry Prove Success

Stimulated by the industrial applications of flood lighting in America, German industries have recently made many successful tests for night illumination of various operations. An especially interesting recent installation is at a limestone quarry in Silesia, illuminating a pit about 1500 ft. long and 650 ft. wide. Formerly night operations were conducted with the aid of the blinding, old-style lamps mounted on portable masts, which not only gave faulty illumination but also required high labor costs to lower them before every blast to prevent breakage. The present illumination consists of five 1500-watt floodlights mounted on ordinary wooden poles on the edge of the quarry opposite the working face, and



Flood-lighting German quarry. Arrows show location and direction of lights.

a sixth on the quarry floor. By proper direction of the light cones the quarry is completely illuminated, leaving no shadows where work is even going on, and it is possible even to sort the stone. The quarry operation is said to be as convenient and safe as in the day, and the installation and current costs are considerably less than in the old-style illumination.—*Die Stein-Industrie*, Berlin, 25:116-8, April 3, 1930.

Factors in Uniformity of Cement Determined

Progress in the manufacture of cement has gone so far in the last few years that there is scarcely a mill that does not produce a cement well above the standard requirements, and the purchaser of cement can well take high quality for granted. What is much more important to buyers now is constancy of quality, applying in about the order of importance to the buyer to (1) time of set and rapidity of hardening, (2) color, (3) apparent density and, as a corollary, fineness of grinding, and (4) quantity of mixing water required.

To produce cement of constant quality two conditions are necessary and sufficient: (1) uniform chemical composition and fineness of grinding of the raw mix, and (2) uniformity of clinkering. The latter is naturally dependent on the former, for no burner, no matter how skillful, can burn cement uniformly when the raw mix is continually changing. The uniformity in the fineness of grinding, in turn, depends on (1) feeding the mills a material suitably prepared, (2) feed as regular as possible, (3) uniform degree of humidity in the material, and (4) uniform temperature of the material. The constant chemical composition of the raw mix, likewise, depends on (1) the nature of the raw materials, (2) care applied to proportioning, and conditions under which the mixing of the raw materials is carried on, and (3) correcting the raw dry or wet mix after grinding. In working a quarry containing materials of varying composition, care must be taken to mix the various rocks actually at the beginning of the crushing and grinding operations, particularly in dry-process mills which lack the excellent homogeneization of the correcting tanks for the wet-process slurry.—Marcel Bernasconi in *Revue des Materiaux de Construction*, March 1930, pp. 81-88.

Fineness Modulus Held Superior to Sieve Test

Earlier interpretations of sieve analyses of concrete aggregates in Germany have been based on the ideal curves for grading of Fuller and Graf, on the principle that the density of the aggregate and the strength of the resulting concrete correspond. Contradictory results and confusing multiplicity of interpretations, however, show that this method and principle have only limited validity. An ideally-graded sand, for example, may be improved in density, but considerably lessened in strength, by an addition of 30 per cent by weight of fine sand. Likewise the determination of the surface areas of the aggregates has limited influence on the strength of the concrete. The continuity which is a characteristic of the ideal curves has not proved itself correct in practice in all cases. On the contrary, gradings that show a jagged sieve-curve, previously considered inferior, have actually proved to be favorable in strength.

A better and more complete method of interpreting the screen analysis is Abrams' fineness modulus reckoned from the sum of the percentages retained on a series of sieves in which each successive sieve has a mesh width double that of the foregoing. All aggregates with the same fineness modulus require the same amount of mixing water and yield the same concrete strength, whereas an endless number of gradings may give the same fineness modulus. This method also makes possible the interpretation of sieve analyses from aggregates in which certain intermediate sizes are lacking, allowing the calculation of methods of improving the grading to reach the desired fineness modulus. It has so many technical and economic advantages that it should be considered for every project of controlling the strength of concrete.—Dr. Ing. A. Hummel in *Zement* 19:355-364, April 10, 1930.

Vibrating Screens in the French Cement Industry

The author (Paul Bertier) recommends a more general consideration of the electric vibrating screen by the cement industry to improve the product by installing a vibrator in closed-circuit with the primary-grinding mill and allowing a more efficient operation in the secondary stage. In certain installations, he says, it has been possible, without any modification of the existing grinding mills, to obtain an increase of 25 per cent in the capacity of the secondary mill. Also the degree of fineness has been improved, and some manufacturers, producing cement of 92 to 93 per cent through the 4900-mesh screen have raised this to 95 per cent. This is an advantage for plants which can not modify their existing grinding equipment except at high cost.—Paul Bertier in *Le Cement* 35:146-7, April, 1930.

Experiment on Hydrates of Tricalcium Aluminate

In a paper presented at the last meeting of the Verein Deutscher Portland-Cement-Fabrikanten, Prof. Wilhelm Eitel discusses the work of Prof. Thorvaldson of the University of Saskatchewan on the hydrates of tricalcium aluminate, emphasizing particularly his finding that ordinary cements, through treatment with steam under pressure at about 150 to 175 deg. C., become, to large degree, immune against the action of sulphate waters. He reports further on the production of pure, well-defined hydrates and on their properties; the higher hydrates with 12, 10.5 and 8 molecules of water are stable only at low temperatures and at 25 deg. yield spontaneously to the regular form of the hexahydrate.—*Zement* 19:394-99, April 24, 1930.

Recent Patents

AMERICAN

Concrete

Process of producing waterproof concrete, especially for paving. Richard Schubert, Bremen, Germany. No. 1,760,214.

Machine for finishing concrete pavements. John F. Robb, Cleveland Heights, O., assignor to Koehring Co., Milwaukee, Wis. No. 1,760,442.

Means and method for finishing concrete surfaces. Joseph W. Heltzel, Warren, O. No. 1,760,596.

Container for transporting and mixing concrete. Arthur C. Avril, Cincinnati, O. No. 1,761,063.

Boom-drive for concrete pavers. Charles E. Foote, Nunda, N. Y., assignor to Foote Co., same place. No. 1,761,716.

Conveying

Load-ejecting apparatus for conveyors. Harold M. Ruth, Huntington Park, Cal. No. 1,760,964.

Grab-bucket. Daniel W. Coe, Montreal, P. Q. No. 1,761,778.

Grinding and Pulverizing

Pulverizing apparatus. William K. Liggett, Columbus, O., assignor to Jeffrey Mfg., same place. No. 1,761,083.

Feeding device for crushers and the like. Charles F. Smith, Milwaukee, Wis., assignor to Smith Engineering Works, same place. No. 1,761,240.

Crushing-roll apparatus. Francis W. Maclennan, Miami, Ariz. No. 1,761,268.

Pulverizing mill. George Galan, Pittsburgh, Pa. No. 1,762,056.

Disintegrating mill. Albert M. Marsh, Wauwatosa, Wis., assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. No. 1,762,122.

Material Handling

Drag scoop. Robert B. Coffman, New Alexandria, Pa. No. 1,760,116.

Clamshell bucket. Theodore Carlson, Seattle, Wash. No. 1,760,812.

Miscellaneous

Pavement and process of laying. Walter H. Flood, Chicago, Ill. No. 1,760,690.

Mining apparatus. Frederick E. Van Slyke, Columbus, O., assignor to Jeffrey Mfg. Co., same place. No. 1,761,060.

Sand cutter. Walter E. Naylor, Chicago, Ill., assignor to Beardsley & Piper Co., same place. No. 1,761,224.

Mixing

Mixing machine. Perry M. Yohe, Minneapolis, Minn., assignor to Koehring Co., Milwaukee, Wis. No. 1,760,101.

Screening

Self-cleaning screen. George A. Turner, Stockton, Cal. No. 1,761,244.

FOREIGN

Burning

Coal-dust-firing mechanism. Georg Hayn. Canadian 300,052.

Firing device for pulverulent fuels, particularly pulverized coal. Allgemeine Elektricitaets Gesellschaft. German 498,202.

Cement

Process for production of a quick-hardening slag cement. Superciman S. A. (Superciments Artificiels). German 498,202.

Manufacture of cement powders and mortar powders. I. G. Farbenindustrie Akt.-Ges. British 328,538.

Concrete

Process for making building stones from clay, sand and cement. Arthur Tetzner. Canadian 300,090.

Process of making porous concrete from hydraulic materials. Sven L. A. Oden. Donovan R. E. Warner and Stig Giertz-Hedstrom. Canadian 300,261.

Process for manufacture of high-strength building units. Usines de Thisselet-Lez-Willebroeck pour le Fabrication des Carreaux en Ciment et de Pieces en Beton. French 685,674.

Crushing and Grinding

Cooling device for centrifugal grinding mills. Eduard Boehme. German 498,467.

Apparatus for grinding mills. Alfred Oskar Schulze. German 498,468.

Apparatus for grinding and mixing materials. Hermann Hildebrandt, German 498,328.

Compartment mill with air-separating current. G. Polysius Akt.-Ges. German 498,469.

Fine-grinding apparatus. Macao-Walzenmuelhen Ges. m. b. H. German 498,739.

Fine-grinding apparatus. Deutsche Babcock & Wilcox Dampfkesselwerke Akt.-Ges. German 498,625.

Device for hammer mills. Maschinenfabrik Buckau R. Wolf Akt.-Ges. German 498,853.

Apparatus for pulverizing coal and like substances. Ashington Coal Co., Ltd., and W. J. Drummond. British 328,437.

Drilling

Rock drill. Holman Bros., Ltd. Canadian 300,236.

Compressed-air hammer for excavating and similar work. Hugo Klerner. German 498,409.

Rock-drilling and like apparatus. C. Sgonina. British 328,246.

Rock drills and like tools. J. L. Holman and A. T. Holman. British 328,235.

Dryers

Dryer. Hermann Haas. German 498,352.

Shaft dryer for pulverulent and coarse materials. Tryggve Ferdinand Christianson. German 499,034.

Kilns

Method of operating tunnel kilns. Harper Electric Furnace Co. Canadian 300,165.

Shaft kiln for the production of cement or the like, in which the raw material is blown in from below. Arthur Charles Davis. German 498,406.

Rotary kiln. Johan Sigismund Fasting. German 498,505.

Process for burning slurry in rotary kilns. Harry Stehmann. German 498,203.

Process for acting on the operation of kilns for calcining lime or dolomite by means of water introduced into the calcining zone of the kiln. Vulcan Feuerungs Akt.-Ges. French 685,592.

Kilns. H. M. Robertson. British 311,316.

Tunnel kilns. H. M. Robertson. British 328,265.

Truck, holder or conveying device for use in kilns, particularly kilns of the continuous type. H. M. Robertson. British 328,264.

Material-Handling

Conveyor and elevator screw. Frank R. McFarland. Canadian 300,069.

Conveying device for pulverulent material. Fuller Co. German 498,490.

Pneumatic conveying device. Deutsche Evaporator Akt.-Ges. German 498,107.

Unloading apparatus. Rhenania-Ossag Mineraloelwerke Akt.-Ges. German 498,108.

Crane. Waagner-Biro Akt.-Ges. German 498,109.

Apparatus for filling bulk materials, especially cement, into sacks. Bates Valve Bag Co. German 498,801.

Conveyor. Etablissements Burton Fils (S.a.r.l.). French 685,493.

Endless conveyor. L. Granges. French 685,495.

Apparatus for stockpiling and reclaiming various materials. Etablissements Burton Fils (S.a.r.l.). French 685,503.

Hopper mechanism for delivering sand, crushed stone, colliery shale and the like. A. Johnson and S. Mills. British 328,363.

Mixing

Mixing machine. Walter F. Dehuff. Canadian 300,042.

Charging device for concrete mixers. The Ransome Concrete Machinery Co. (George T. Allen). Canadian 300,418.

Concrete mixer. Koehring Co. German 498,951.

PIT AND QUARRY *will furnish, at its actual cost, a copy of any patent cited above. A charge of ten cents per copy is made by the U. S. Patent Office, Washington, D. C., and readers may procure a copy directly by addressing the Commissioner of Patents, with payment for copies requested. Postage stamps are not accepted by the Patent office. We will endeavor to obtain copies of foreign patents for our readers but we cannot give assurance in every case for the reason that copies of such patents are not printed for distribution as liberally as are the American copies, nor is there a fixed charge per copy.*

Mixing apparatus. A. B. and C. R. Smith. British 328,401.

Screening and Separating

Rotary screen. James Gordon Allen. Canadian 300,264.

Air separation process. Albin Berthold Helbig. German 498,470.

Screening device. Ernst Curt Loesche. German 498,777.

Process and apparatus for screening materials. M. P. Reynolds. French 685,552.

Improvements in vibrating screens. F. Pirlot. French 685,696.

Separation of materials. J. L. Bramwell, C. W. H. Holmes and Birtley Iron Co., Ltd. British 328,283.

Miscellaneous

Concrete - distributing machine. Koehring Co. Canadian 300,173.

Process for converting phosphate rock into soluble compounds. Odda Smelteverk A/S (Erling Johnson). Canadian 300,190.

Opening and closing device for mine doors. Bryan Smith. Canadian 300,454.

Process for coloring stones, particularly crystalline stones such as marble. Canova Marmor-Werkstaetten G.m.b.H. German 498,588.

Process and apparatus for geophysical examinations permitting the exploration of underground deposits. Mines Domaniales de Potasse d'Alsace. French 685,487.

Preparation of silica gel. A. P. Okatoff. British 328,241.

Concrete and plaster key-molding strip. J. H. Bennetts. British 328,316.

Cable-making and like machinery. F. J. Humphrey. British 328,225.

Supports for plaster. Schweizerische Drahtziegel Fabrik Akt.-Ges. British 312,355.

Machines for consolidating wet concrete in molds. H. Peace. British 328,467.

Device for mechanically emptying superphosphate chambers. J. Zatney and Towarzystwo Zakladow Chemicznych Strem Spolka Akcyjna. British 328,486.

Composite plaster boards or slabs intended particularly for building purposes. A. Hartley. British 328,326.

Elect Bauer President of Kensington Steel Co.

Following the death of President Walter Smart McKee, the board of directors of the Kensington Steel Co., at a recent special meeting, elected the following officers to carry on the organization so ably founded and conducted by Mr. McKee: Eugene C. Bauer, president; Kenneth Jensen, vice-president and general manager; Walter F. Mandel, treasurer; L. Garris Alt, secretary.

Sticky and Abrasive Material Handled by Portable Conveyors

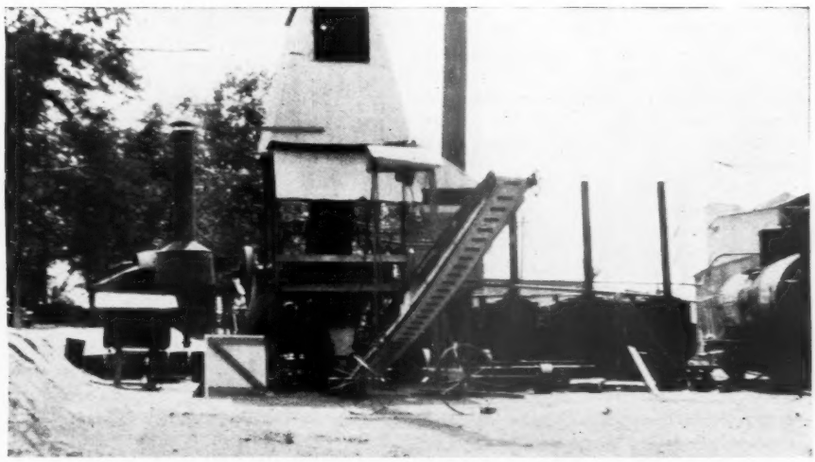
A mixture of asphalt, sand and stone screenings, at a temperature of 200 deg. F., is handled by portable conveyors from a Warren machine (a type of pug mill), direct into railroad cars or onto a curved stock pile, at the Western Asphalt Paving Co. plants at Richmond, Va., and Lancaster, Pa.

These Link-Belt portable conveyors are 36 ft. long and 26 ft. long, respectively, and have swiveling wheels which makes it possible to build up the stock pile with ease.

This mixture is somewhat sticky and is more than ordinarily abrasive. The pug mill discharges a 1,000-lb. batch to the loader about every two minutes. This sudden load causes the conveyor barely to hesitate and, in a few seconds, the motor has recovered full speed and the batch is over the head pulley. This is quite severe service considering the steep angle at which the conveyors are used but, as the standard motors for these loaders are more than powerful enough to carry an abnormal load, and as the idlers are equipped with Timken roller bearings, they have no difficulty in handling these batches.

The loading of cars and storing of the material would be too costly with wheelbarrows. On the other hand, it is of far too little volume to justify a derrick, or a clam shell crane which would mean an operator idle most of the day.

There are many places where a portable loader will fit in the production system of any industry, with similar savings in labor and investment.



Portable conveyor handling asphalt-coated screenings.

Continental Motors to Grant Workers Vacation

In line with a number of other large manufacturing concerns, Continental Motors Corp. announces a general vacation for all employees for two weeks beginning June 29 and ending July 14.

W. R. Angell, president of the company said, "We have so arranged our production and shipping schedules that we can give all our employees their annual two weeks vacation at the same time. We have learned from others that this plan works out very well and saves confusion which usually results when the vacations are strung out through the summer."

Wm. J. Kuntz, president and general manager of the Lime & Hydrate Plants, Inc., of York, Pa., and formerly vice-president and sales manager of H. Miscampbell Co., Inc., Duluth, Minn., is now connected with the Blaw-Knox Co., as general manager in charge of the lime-plants division.

Plant Abandons Quarry for Underground Mining

The Ash Grove Lime & Portland Cement Co., Louisville, Neb., recently discontinued the open-quarry method of mining limestone in favor of underground mining. The change was made because of the expense involved in stripping overburden. Two electric shovels were purchased from the Bucyrus-Erie Co. to handle the rock in the mine rooms, one of which is shown in the accompanying illustration.

Electric tunnel shovel in mine.

Legal Information for Operators

Payment for Extras Not Ordinarily Recoverable

Usually, a subcontractor is not entitled to recover payment from the principal contractor for extras, unless the contract is construed or interpreted that the owner is liable to the principal contractor for payment for the extras.

For illustration, in Cold Spring Granite Co. v. Jacobson Bros., 228 N. W. 344, it was disclosed that a principal contractor had a contract for building a cathedral. A company operating a granite quarry had a subcontract with the principal contractor for furnishing all the granite necessary for the construction of the building for the sum of $21,000. Discussion arose over the payment by the principal contractor to the granite company for two extra items comprising a base for a front porch and material used in the basement entrances. The principal contractor promised that he would pay the granite company providing the owner paid him.

The authorities in charge of the building of the cathedral claimed that under the plans and specifications the granite covered by the two items came within the general contract. The contract specifically referred to the plans, drawings, and specifications which were made parts thereof. By competent evidence it clearly appeared that the two items were not extras, since the plans and specifications included the work and material required to construct the front porch and the basement entrances.

Therefore, the higher court held the principal contractor not required to pay the granite company, and said:

"The jury was justified in believing that the defendant (principal contractor) did not specifically or impliedly consent or promise to pay the items and that they were only to be paid in case of their allowance as extras."

Paying Freight Charges by Check Held Unlawful

Generally speaking, payment to a common carrier of freight charges by any medium except cash is invalid. So held the higher United States Court in Fullerton Co. v. Chicago S. P. & P. R. Co., 36 F. (2d) 180.

In this case a consignee gave his check on a state bank in payment of freight charges on a carload of goods consigned to it and carried in interstate commerce. The local agent for the railroad company accepted the check as payment and receipted the freight bill. The check was not presented by the railway company for payment to the bank on which it was drawn until after the bank had closed its doors, which was 6 days after delivery of the check, and consequently it was never paid.

The carrier filed suit to collect the freight charges and the consignee argued that it was not liable, (1) because the carrier had receipted the freight bill, (2) because the carrier negligently held the check for 6 days before presenting it for payment, and (3) because payment by check is equivalent to cash.

However, the Court held the consignee bound to pay the charges, and said:

"It is the usual rule, in the absence of an express agreement otherwise, that payment by draft or check is conditional payment only, ripening into absolute payment when the draft or check is in fact paid. . . . A paramount purpose of the regulation of carriers is to compel uniform treatment of shippers, and the exaction of the published freight charges in cash payment from each and all shippers alike is a necessary step. . . . It must follow that the payment by the check was unlawful and that the plaintiff (carrier) herein is entitled under the law to recover, in this suit, the charges for the freight which have never legally been paid."

Hold Railway Engineer Must Maintain Lookout

The law expects engineers and firemen to maintain a sharp lookout to prevent injury to pedestrians and the drivers of motor vehicles. The far-reaching effect of this rule of the law is well illustrated in Southern Ry. Co. v. Ashby, 36 F. (2d) 352.

In this case, it was disclosed that a train was rounding a curve, swinging to the left. A motor-truck was approaching the crossing from that side. The engineer, who was maintaining his lookout, could not see the automobile because the boiler cut off his view. The fireman, who could have seen it, had stepped back to the tender and was engaged in preparing his "coal boards" to be ready for receiving coal at the next station, which they were then approaching.

The train struck the vehicle whose injured driver sued the railway company to recover damages. Notwithstanding the fact that the counsel for the railway company argued that the fireman's work prevented him from maintaining a lookout, the higher United States Court held the injured person entitled to a judgment, saying:

"Firing the engine is necessary to the progress of the train. . . . In the present case, the evidence is not inconsistent with the full ability of the fireman to arrange these coal boards, either at the next stop without any prejudicial delay, or, if it should be done while running, at a time when the engineer could perform the full duty of lookout ahead or at a time when they were not approaching a crossing where obstructions might appear on the fireman's side. . . . It had been the accepted rule that an effective lookout must be maintained by one or the other of the enginemen, and, if one could not look effectively but the other could, the latter must."

Dealer Faces Liability for Poor Construction

Since a common source of litigation involves the question of whether or not a contractor or material man is liable for supplying defective materials, the late case of City of McPherson v. Stucker, Stucker & Strachan, 282 Pac. 703, imparts valuable information on different points of the law.

In this case it was disclosed that a contractor contracted to build a waterproof concrete tower for the city in question. The contractor guaranteed that the tower would not leak for one year. The specifications called for a particular kind of waterproofing material. After the work had been completed it was discovered that the tower leaked. The city officials were compelled to employ another contractor to remove the waterproofing material and apply a different grade. The city filed suit against the contractor to recover $6,000—the amount expended in repairing the tower.

The contractor contended that he was not liable because he had used the kind and grade of waterproofing material specified in the contract. However, since the contract specified that the contractor guaranteed the tower against leaks for one year the Court held the contractor liable for $6,000, and said:

"The contractor took the position that, since the contract specified the character of waterproofing to be used on the tower, and that having been used, he was not liable for the defects in the tower resulting therefrom. . . . Under the contract the contractor had guaranteed a watertight structure and he was liable to the city for the breach of that guarantee."

Move Into New Quarters in New Lincoln Building

Among the tenants of the new Lincoln Building, 60 East Forty-Second St., New York, N. Y., are the G. M. Basford Co., and The Superheater Co. Both companies formerly maintained offices at 17 East Forty-second St.

Insurance Problems Discussed

Credit Insurance

Credit insurance came into existence because there is a commercial mortality just as surely as there is a human mortality. Panics in commercial affairs are analagous to epidemics. Panics come at close but irregular intervals. A period of depression causes terrific losses to the insurance companies. They do not raise rates, however, since these are based on long-run averages.

Entirely apart from the cycles of business prosperity and depression, there are other elements constantly at work eating into profits, notably fraud, incompetency and speculation. Fraud can be committed regardless of the general condition of business. The incompetency of a person to run his business successfully can lead to bankruptcy at any time. Speculation by a customer with your credit or material is also a constant serious risk.

To meet these needs, the substance of a credit insurance policy is as follows.

Policy Coverage

Credit insurance guarantees the insured against loss on covered accounts in excess of the agreed normal loss for his particular business, provided such loss arises from the insured's *bona fide* sales of material or merchandise.

The so-called "normal loss" is uninsurable for three reasons. In the first place, if an insurance company had to adjust and pay every tiny business loss that came along, the administrative expense would make the cost of insurance unbelievably high. Secondly, undue generosity in an insurance policy would permit an unscrupulous business man to grant credits too freely, leaving the insurer "holding the bag" on his deliberately reckless judgment. The present policy form virtually offers a reduced cost if you keep your losses down to less than "normal" and it thus encourages careful credit. In the third place, there has never been a year that has not shown losses by bad debts. There is no advantage in insuring that portion of loss which is certain to occur; it is more economical to insure only the larger losses which are uncertain.

Kind of Accounts Covered

An insurance company could not base its coverage, as respects any applicant for credit, on the judgment of the insured alone and, therefore, to be unbiased by the individual prejudice of either the insurer or the insured, an entirely neutral agency or "umpire" is selected, and upon the ratings of the neutral umpire the coverage is based. This forms a condition precedent to the coverage of an account and seems to be the only equitable way to handle the situation. The ratings of a mercantile agency are taken as a standard by which the insurance company can measure its obligations and liabilities. The determination of those ratings and the amount of credit which can reasonably be extended to each debtor having a certain rating is no longer a haphazard guess but is based on actuarial statistics.

Collection Service

While reimbursement for abnormal losses would naturally be deemed the primary object of credit insurance, the greatest value of a policy is usually derived from the service that can be obtained in the collection of accounts and the cooperation between the company and insured in prevention of losses. A former insurance commissioner of New York once asserted that "The real function of an insurance company is to prevent the loss that it indemnifies against, and credit insurance goes much farther in loss prevention service than do most forms of coverage."

While no statistics are available, it can hardly be doubted that more accounts are lost by the creditor's temporizing with the debtor—in the belief that he is good and with the natural desire to retain his business—than through any other cause. A debtor enters into an agreement to pay within a certain time for merchandise or material purchased. There probably are some specific instances where there are legitimate reasons for delay in meeting the agreed terms of payment but, in the majority of cases, such delay is due to lack of financial responsibility or insufficient capital for the successful conduct of business.

The debtor who cannot pay his obligations as they mature is usually not making good money. A successful business does not have to borrow much, if any, from its creditors. In other words, a "slow pay" customer cannot be described as being in a healthy condition, and yet commonly the seller hopes his customer is all right and is anxious to retain the account.

Handling of Losses

The method of handling an account under a credit insurance policy is about as follows.

Let us, first of all, assume that the stated credit period for this insured is thirty days, and that forty-five days represents the limit of financial safety.

At the end of thirty days, the insured writes to the customer stating that under his policy the account must be turned over to the insurance company, and that while he should like to favor this customer, he is powerless to stop the collection machinery. Next the insurance company writes a form letter (or two, if necessary). These systematic "duns" bring in all the slow-pay items, leaving only the actually bad accounts for personal collection or suit. This inflexible rule, under which your customers know you do not play favorites, plus the definite, though mild, threat of persistent action by a big, impersonal insurance company brings in the money without losing the customers' good will.

It should be noted, however, that if you have an individual account from which you want the insurance company to keep away, you can exempt such an account from both the requirements and the coverage of your policy.

Where does the credit man fit into this insurance scheme? Insurance is not supposed to put the credit man out of business. He is needed constantly—to pass on unrated accounts, to determine the size of credits within the policy limits, and to hold down losses so that the insurance rate will be low. But the best credit man is at the mercy of cycles of business depression and other losses beyond his control, and credit insurance is the only complete guarantee.

National Standards for Gauges Recommended

The establishment of national standards for pressure and vacuum gauges was recommended at a general conference held in New York City on May 15 under the auspices of the American Standards Association. Thirty-five representatives of manufacturers and users of pressure and vacuum gauges and of technical, governmental and safety bodies having an interest in such gauges were present at the conference.

The regular method followed by the Association in these matters is to set up a technical committee which will, in the present case, be made up of official representatives of manufacturers and users of pressure and vacuum gauges of other organizations and specialists having an important interest in this field.

The following manufacturers were represented: Acme Gauge & Instrument Co., Ashton Valve Co., Brown Instrument Co.; Consolidated Ashcroft Hancock Co., Crosby Steam Gauge & Valve Co., Foxboro Co., James P. Marsh & Co., Motor Meter Gauge & Equipment Corp., C. J. Tagliabue Mfg. Co., and Taylor Instrument Co.

New Machinery and Supplies

Car Puller on Transfer Car Built for Brick Co.

A special power-driven transfer car, recently built by Stephens-Adamson of Aurora, Ill., for a Missouri brick plant, not only carries loaded brick trucks from place to place about the plant, but is also equipped with a car puller for pulling the trucks from drying ovens, side tracks, etc.

The car operates on standard-gauge track and is equipped with Hyatt roller bearings in special U-bolt mountings for low clearance. Alemite lubrication fittings and labyrinth grease seals are used to insure proper lubrication under the heavy loads carried.

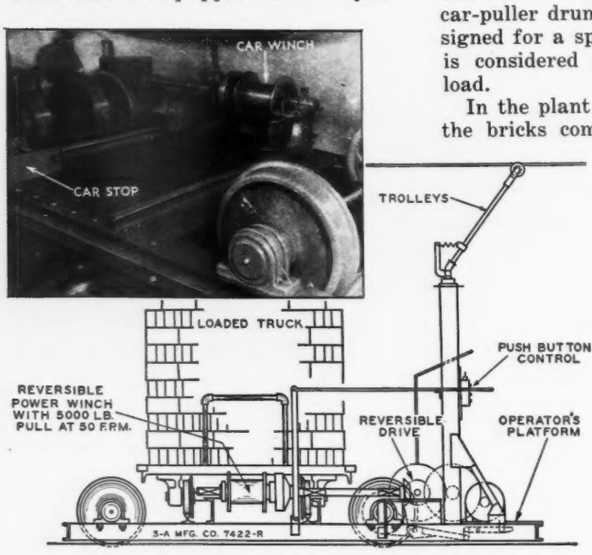
A 5-h.p. Westinghouse motor is used to drive both car and puller drum. Westinghouse push-button control is used to stop, start and reverse. The car-puller drum holds over 200 ft. of cable and exerts a rope pull of 5,000 lb. at 50 f.p.m. When the clutch is disengaged, a spring friction on the drum keeps the cable taut as the operator carries the hook to the cars to be pulled.

Friction clutches are used on both drives and help start the loads gently where a sudden start might jar the wet brick or disturb the load. Both car-puller drum and car drive are designed for a speed of 50 f.p.m., which is considered a safe speed for any load.

In the plant where this car is used the bricks come from the brick machines on a flat belt conveyor. Men stationed along the conveyor inspect and pile the perfect brick onto industrial trucks. Care is taken in spacing the load to permit a free circulation of air through the brick.

These trucks each hold several thousand bricks and, once loaded, are moved from point to point during the process of drying, grading and storing. Ordinarily a certain amount of hand pushing is necessary, often requiring one or two men in addition to the operator of the car.

With this special car, the operator simply hooks his cable onto one or more cars to be transferred, throws in his clutch and pulls them to his car at a speed of 50 ft. per min.



Unloading transfer car with car puller.

Car Replacer Requires No Spikes or Fasteners

Requiring neither spikes, clamps nor fasteners of any kind to hold them in place on the rail, the car replacers manufactured by the Johnson Wrecking Frog Co., of Cleveland, O., have been used by mines, quarries and industrial plants for 28 years.

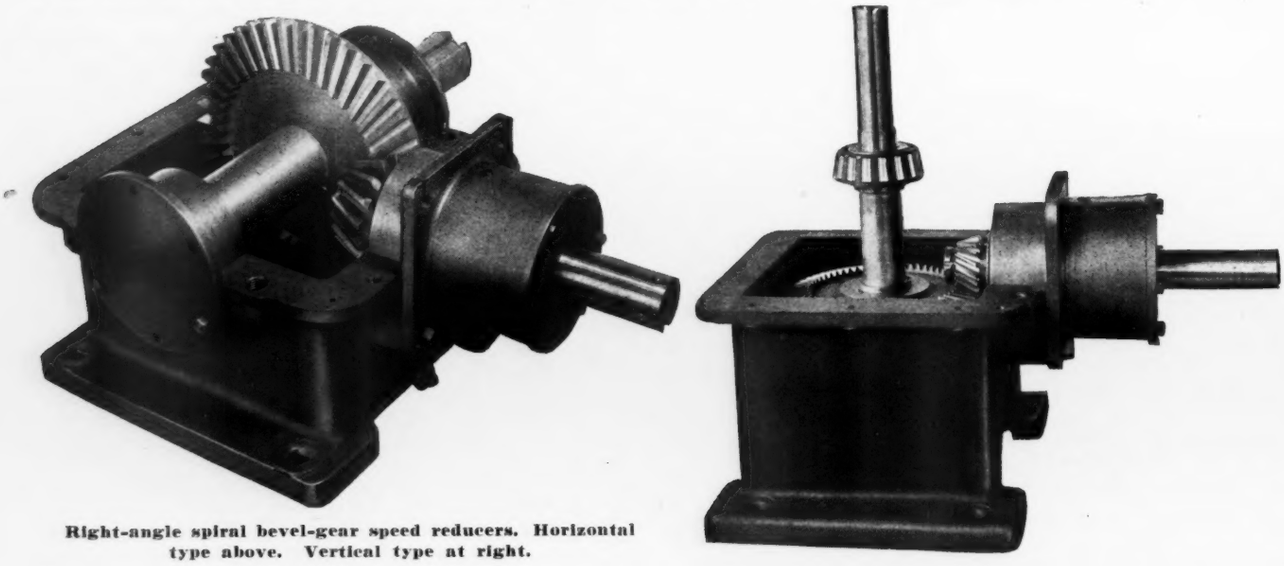
The replacers are made in right and left pairs to straddle both rails of the track, adjusting themselves to varying heights of rail, forming a friction grip with the rail when in operation. Rails are brought to gauge during replacement and the load is thus distributed evenly on the rail, not on one or two ties. The replacers are built of open-hearth cast steel, properly annealed.

The company also manufactures car rerailers and wrecking frogs.

Bevel-Gear, Right-Angle Speed Reducers Offered

A new type of right-angle speed reducer has been placed upon the market by the D. O. James Mfg. Co., Chicago, Ill. This consists of spiral bevel gears mounted on Timken roller bearings. This new line includes both horizontal and vertical types, with the slow-speed shaft extended either upward or downward.

The power ratings range from one-quarter hp. to 100 hp., with ratios ranging between 1:1 and 6:1. Larger reductions are obtained by the combination of the spiral bevel gear and planetary spur gears with ratios of 8:1 to 1600:1, or more. The gear teeth and bearings are lubricated by the splash system.

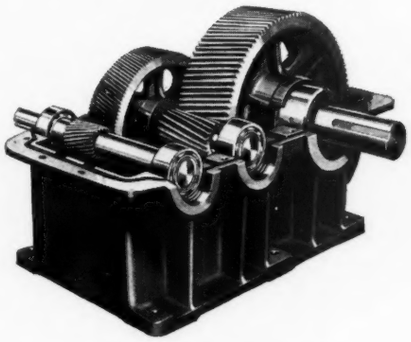


Right-angle spiral bevel-gear speed reducers. Horizontal type above. Vertical type at right.

Herringbone or Helical Gears in New Reducers

Foote Bros. Gear & Machine Co. has recently placed on the market a new line of anti-friction speed reducers, known as the IXL Titans, available with either herringbone or helical gears.

Both reducers are identical in design with the exception of the gears. Cases are cast from close-grained grey iron. Ribs are provided at each bearing for rigidity. No gaskets are used between halves as accurate machining makes this unnecessary. Oil-return grooves are provided for the return of the oil to the bottom of the case. Splash lubrication is standard. SKF bearings are used on the



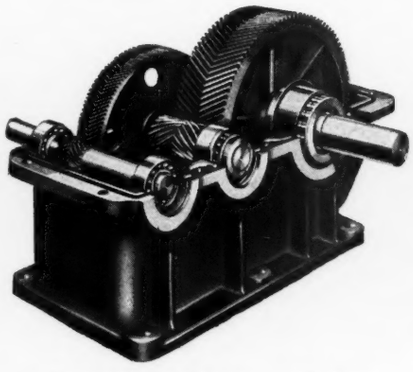
Helical reducer—open type.

high-speed shaft, and Hyatt roller bearings on the slow-speed shaft.

The principal features of the IXL Titan reducers from a service standpoint are quietness, freedom from vibration, smoothness of power transmitted, high efficiency and ability to stand up under severe operating conditions subject to shock and overload.

The desirable features of heat-treated and hardened gears have been adopted as standard in the helical type, giving great load-carrying capacity. This permits the selection of a smaller unit with smaller gears to be used for a given load and greatly increases the service life of the reducer.

Heat treating of gears is not practical with herringbone gears because of the harmful effects of distortion resulting from the heat treating of



Herringbone reducer—open view.

two opposed helixes and because the correct load distribution of herringbone gears is dependent upon the accuracy of the helix angles.

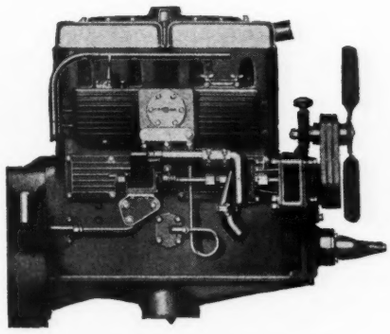
On account of the heat-treating and hardening features of the gears for the helical reducer, it is possible to obtain a horsepower rating on the slow-speed shaft at least 25 per cent higher than the ratings for the herringbone reducer of the same size.

Adopt New Engine for Portable Compressors

Metalweld, Inc., Philadelphia, Pa., is introducing a number of revolutionary developments in its latest type of Metalweld-Worthington portable air compressors. The H-model Continental engine has been adopted, and since May 1 has been used as the power unit for all compressors of 220, 280 and 330-cu. ft. displacement.

The oil circulation in this engine represents one of the greatest advances in gas-engine design in recent years, and was developed with the purpose of reducing operating temperatures, which is a vital factor in air-compressor use. Actual tests have shown reductions in temperature of circulating oil as great as 35 deg. F.

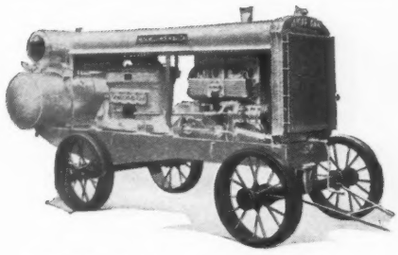
A separate low-pressure pump takes the oil, as rapidly as it collects in the bottom of the pan, and forces it up to the reservoir where it first passes through a metallic disk filter set in a separate built-in, open-top



New model gasoline engine.

filter compartment of the reservoir. In this filter the oil is forced between the core of a series of centerless discs which alternate with a series of copper wiper plates. The foreign matter in the oil lodges between these disks and can be removed daily by turning a handle located at the outside of the reservoir which rotates the metal disks against the stationary wiper plates. The dirt collects in the cleaner compartment and may be drained off separately without disturbing the clean lubricating oil. The cleaned oil overflows from the cleaner compartment into the reservoir proper, whence it flows by gravity to the high-pressure oil pump for recirculation to the main bearings and all bearing surfaces.

Other new additions to the Metalweld-Worthington Compressor include a primer pump for cold-weather starting. A rich gas vapor is forced into each cylinder, which is much more



Portable air compressor of 330 cu. ft. displacement.

satisfactory and less harmful to the engine than use of the choke.

Two air cleaners are furnished with each unit—one for the engine and one for the air compressor.

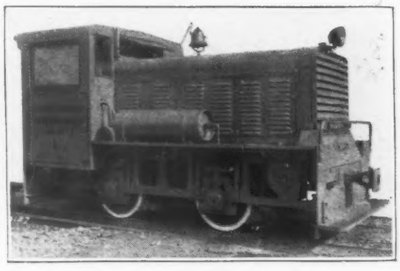
Vulcan Introduces New Gas-Electric Locomotive

The Vulcan Iron Works has recently brought out a new line of gas-electric locomotives. The one illustrated herewith is a 12-ton narrow-gauge locomotive for use in an asbestos mine in Quebec.

This 12-ton locomotive is powered with a 120-hp. Buda 6-cylinder gasoline engine direct-connected to a 250-volt d. c. shunt-wound generator for furnishing electric energy to two Westinghouse mine-haulage motors geared to the axles.

The locomotive is provided with a combination throttle and motor control. The controller has two handles, the speed handle controls the electromagnetic switches, operates the engine throttle, regulates the generator-field excitation, and the starting, accelerating and speed of the locomotive. A separate reverse handle is provided for connecting the motors in "series" or "parallel" positions, and for "reverse" or "forward" directions. Movement of the speed handle from the "off" to the "pump" position speeds up the engine for operating the air compressor without running the locomotive.

The locomotive has standard, cast-steel, bar-type frames; steel-tired wheels 30 in. in diameter; steel-plate bumpers; cast-steel, single-pocket coupler with spring draft gear; semi-



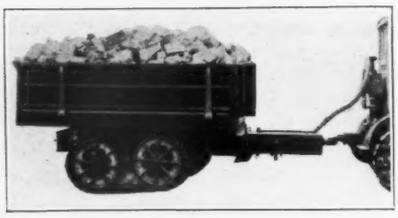
New gas-electric locomotive.

elliptic springs, cross-equalized; 4 steel sand boxes equipped with air sanders; brakes applied through the Westinghouse air-brake equipment and auxiliary hand lever; steel cab with double glass windows and an exhaust heater furnished especially for use in cold climates. The locomotive is compactly built, being only 13 ft. 67 in. long over the bumpers, 71 ft. wide and 8 ft. high.

Wagon Dumps Three Ways and Lays Its Own Road

The LaPlante-Choate three-way dump wagon will meet any need of the operator, for side or rear-dumping equipment, in that it dumps either to the rear, to the right or to the left. It is built by the LaPlant-Choate Mfg. Co., Cedar Rapids, Ia. It is hydraulically operated, with downfolding doors which open and close automatically as the body is raised and lowered. The entire dumping operation is controlled by the tractor operator from his seat on the tractor.

The body on the dump wagon is built by the Differential Steel Car Co., of Findlay, O., which has been making dump bodies for trucks and railway cars for a number of years. Their experience and success in building bodies have been combined in the construction of this new body which



Crawler-mounted three-way dump wagon.

is mounted on LaPlant-Choate chassis and "roadlayer" tracks.

The body, frame, and tracks are built entirely of steel, made to withstand the roughest treatment and hardest usage.

Because of the absolute and quick escapement, this wagon is particularly adaptable to building roads or dams in mountainous territory where the fills have to be either side or end. The discharge opening is so large that the widest shelf rocks, handled by the shovels today, can be easily dumped. It is also ideal for use in rock quarries or places where materials are to be dumped on conveyor belts.

New Portable Oil-Stone Grinder Direct-Driven

In response to an insistent demand for a popular-priced oil-stone grinder. J. D. Wallace & Co., of Chicago, have designed and placed on the market an efficient, compact unit.

The grinder is equipped with a ½-hp. motor. There are no belts in the construction, the motor is directly connected and the oil-stone wheels are geared for the proper speed.

The equipment includes two oil-stone wheels, one fine and one coarse, an emery wheel, and a cone. The fence is easily and quickly adjusted for any angle with a positive locking arrangement. The adjustment for moving the fence to and from the wheel is governed by a conveniently placed hand wheel.

Ball-and-Socket Pillow Block Made Dust Tight

The Link-Belt Co. has recently placed a new Timken anti-friction ball-and-socket pillow block on the market. Designed several years ago, it has been improved and perfected in the meantime, and has been actually service-proved in practically every type of service.

These pillow blocks are designed to fit any good grade of commercial shafting, from 1 7/16 in. in diameter to the largest size, without special fittings or the use of appliances.

Because these pillow blocks use pressure lubrication, they are practically dust-tight. The grease is forced in at the center and out at the shaft openings, thus, with the addition of the grease seal at the top, dust and grit are kept out of the bearing. The grease stays inside the bearing, where it belongs.

Ball-and-socket pillow block.

Use 55-Ton Locomotives in Stripping Operations

The picture at the left on the bottom of the page shows one of the seven 55-ton steam locomotives, made by the Heisler Locomotive Works, Erie, Pa., used in stripping operations by the Lehigh Navigation Coal Co. The locomotive handles a train of four loaded 30-cu. yd. dump cars up steep grades with comparative ease. The other picture shows a 32-ton Heisler used by the Haddock Mining Co. at its collieries near Silverbrook, Pa.

Heisler geared locomotives are being used extensively in mine and quarry work throughout the world. They are built in sizes ranging from the 24-ton to 90-ton. Features of the locomotives include such important details as swiveling trucks, center drive-shaft and a complete lubricating system. Eight driving wheels are standard on sizes up to and including the 65-ton model; the larger sizes carry twelve. Driving wheels range in size from 30 in. to 40 in. in diameter.

A 55-ton locomotive hauling train of 4 loaded 30-cu. yd. dump cars.

A 32-ton locomotive climbing a 4½ per cent grade with 4 loaded 10-cu. yd dump cars.

Manufacturers' Publications

Each publication listed below contains information of interest to non-metallic mineral producers. Readers may obtain, without charge—except where a price may be stated—and without obligation, copies of any of these publications by writing directly to the manufacturers who publish them. Please mention PIT AND QUARRY *when writing.*

Cranes

Gasoline and Diesel Locomotive Cranes. 16 p., 22 ill. (Booklet 309. Industrial Brownhoist Corp., Cleveland, O.) Describes and illustrates a complete line of gasoline and Diesel-powered locomotive cranes, including machines ranging from 10 to 40 tons capacity.

Dryers

Drying Your Product. 4 p., 2 ill. (Hardinge Co., York, Pa.) Describes and illustrates the nine different types of Ruggles-Coles dryers designed to meet a variety of drying needs.

Feeders

A Measuring Feeder That Regulates by Weight. 4 p., 2 ill. (Hardinge Co., York, Pa.) Describes and illustrates a constant-weight feeder that measures by weight instead of by volume.

Hoists

"Up Goes the Load—Down Goes the overhead." 1 p., 2 ill. (*Heil Quality News* for May, 1930. The Heil Co., Milwaukee, Wis.) Describes and illustrates the use of a high-lift hoist used for elevating concrete mixer bodies for efficient unloading.

Lighting Equipment

National Carbide Lights. 18 p., 16 ill. (National Carbide Sales Corp., New York, N. Y.) Describes and illustrates portable carbide-gas lights for use in underground workings and for night operation.

Locomotives, Steam

Why You Can Haul at Least 30% More per Ton of Locomotive With the Modern Heisler. 32 p., 80 ill. (Heisler Locomotive Works, Erie, Pa.) Describes several types of locomotives and points out their ability to haul great loads by illustrations of actual installations throughout the country.

Lubrication

Alemite Industrial Lubrication. 8 p., 10 ill. (Vol. IV, No. 3. Alemite Corp., Chicago, Ill.) Describes and illustrates the use of high-pressure lubrication on a wide variety of machines and illustrates some of the grease fittings used.

Packers

Monarch Packing Machines. 16 p., 25 ill. (EE No. 123. Sprout, Waldron & Co., Muncy, Pa.) Describes and illustrates a complete line of packing machines for all fine materials.

Plant Equipment

From Mother Earth to the Finished Highway. 32 p., 30 ill. (Iowa Manufacturing Co., Cedar Rapids, Ia.) An ingenious little booklet, illustrating in a unique manner the machinery manufactured, and the services offered, by this concern.

Kennedy Products. 112 p. Profusely illustrated. (Bulletin 16. Kennedy-Van Saun Manufacturing & Engineering Corp., New York, N. Y.) Describes a wide range of machinery and supplies used in mining, crushing, chemical and Portland cement plants. Repeats Bulletin 15 in first 80 pages. Remainder is entirely new.

Pulverizers

Monarch Ball-Bearing Attrition Mills. 32 p., 81 ill. (D. No. 130. Sprout, Waldron & Co., Muncy, Pa.) Describes and illustrates attrition mills made by this company and their application in the grinding and pulverizing field.

The Raymond Midget Mill. 4 p., 3 ill. (Raymond Bros. Impact Pulverizer Co., Chicago, Ill.) Describes and illustrates a small pulverizing unit of the roller-mill type.

Screens, Intake

Link-Belt Intake Screens. 24 p., 35 ill. (Book No. 1252. Link-Belt Co., Chicago, Ill.) Describes and illustrates traveling intake screens for obtaining water free from refuse and objectionable foreign particles.

Screens, Vibrating

Huron Heaviduty Screens. 12 p., 13 ill. (Huron Industries, Inc., Alpena, Mich.) Describes and illustrates a vibrating screen of unusually-heavy construction and lists specifications.

Seal Rings

Huron Seal Rings for Kilns, Dryers, and Coolers. 10 p., 13 ill. (Huron Industries, Inc., Alpena, Mich.) Describes and illustrates a practical and effective ring for sealing the joints in revolving kilns, dryers, and coolers.

Speed Reducers

"Jones Helps Convert Oyster Shells Into Lime." 1 p., 4 ill. (*The Jones Monthly Outlook* for June, 1930. W. A. Jones Fdry. & Machine Co., Chicago.) Describes and illustrates the use of speed reducers in the plant of the Haden Lime Co., Houston, Tex.

Huron Heavy-Duty Speed Reducers. 24 p., 27 ill. (Huron Industries, Inc., Alpena, Mich.) Describes and illustrates mill-type speed reducers and points out their apparent advantages. Specifications and construction details are included also.

Trucks

International Harvester Six-Speed Special. 12 p., 17 ill. (International Harvester Co., Chicago.) Describes and illustrates a motor truck with a 6-speed transmission and shows its adaptability to a wide variety of uses.

Independent Pneumatic Tool Company Expanding

The Independent Pneumatic Tool Co., Chicago, manufacturers of electric and pneumatic tools and air compressors, has purchased the Cochise Rock Drill Mfg. Co. of Los Angeles. This purchase is part of an expansion program inaugurated a year ago. The plant of the Cochise Co. will be expanded, additional workmen will be employed and products will be incorporated in the present line.

The newly-acquired plant will operate as a unit of Independent Pneumatic. There will be no change in personnel or methods. The Independent Pneumatic Tool Co. was established twenty-five years ago and has grown rapidly. Last year a new and modern plant addition was built and today the factory covers an entire city block in Aurora, Ill.

New Corporations

Greenbrier Limestone Co., Bowden, W. Va. George T. Watson, supt. $25,000.

Crystaline Products, Ltd., Hamilton, Ont., Can. $10,000. To produce limestone, gypsum and by-products.

Artstone Quarries, Inc., Etowah, Tenn. August J. McClary, Clyde Rule, E. Rhode. $50,000.

Cheak-Stevens Stone Co., Okolona, Louisville P. O., Ky. Robert Stevens. $1,000.

Newport Quarries, Newport, N. Y. Bryce D. Blakeley, president; Carl E. Dedeicke, treasurer; F. C. Mickle, general manager. $50,000.

Eldorado Quarries, Ltd., Toronto, Ont., Can. Frank Howes, Herbert Howes. $25,000.

Closter Stone Quarries, Inc., Englewood, N. J. Adolph L. Engelke, Jersey City, N. J. $125,000.

Glenridge Stone Co., Millersburg, Ohio. Charles F. Schnee, Treve Marshall, Vernon H. Schnee. $50,000 and 1,500 shares n.p.v.

Wiley Gravel Co., West Alexandria, Ohio. Clarence and Walter R. Wiley.

Moose Jaw Sand and Gravel Co., Ltd., Moose Jaw, Sask., Can. $10,000.

Premier Sand and Gravel Co., Ltd., Vancouver, B. C., Can. $100,000.

Colfax Gravel Co., Inc., Alexandria, La. $75,000.

Brooklyn Sand and Gravel Corp., Ft. of 37th St., Brooklyn, N. Y. 100 shares com.

Arkansas Bauxite Co., Little Rock, Ark. Edgar G. Hanschke, president; Dr. S. P. Junkin, vice-president and treasurer; John F. Evans, secretary. $25,000. To develop bauxite deposits near Granite, Little Rock P. O., Ark.

Chicago Insulcrete Co., Franklin Ave. and Ernest St., Franklin Park, Ill. Edgar H. Boesenberg, treasurer; Ben J. Frodin, sales manager. $100,000. To manufacture cinder blocks.

Latest Portland-Cement Statistics

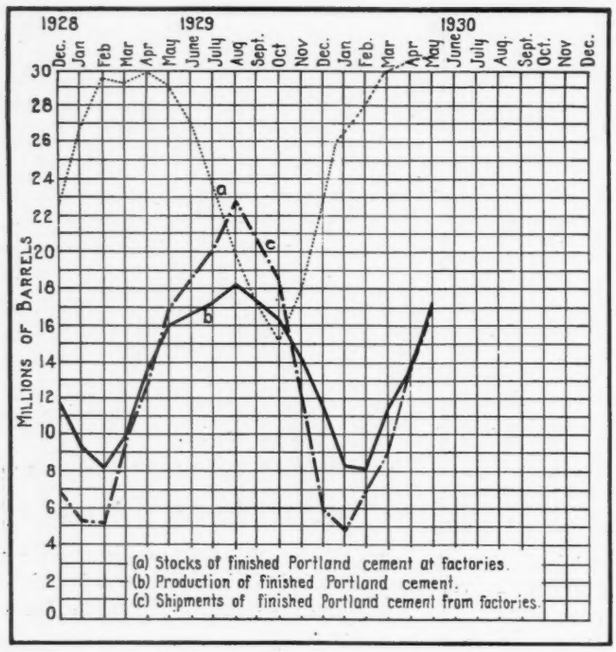

1928
1929
1930
Dec. Jan Feb Mar Apr May June July Aug Sept. Oct Nov Dec. Jan Feb. Mar Apr May June July Aug. Sept. Oct. Nov Dec.
Millions of Barrels
30 28 26 24 22 20 18 16 14 12 10 8 6 4 2 0
a
b
c
(a) Stocks of finished Portland cement at factories.
(b) Production of finished Portland cement.
(c) Shipments of finished Portland cement from factories.

Chart showing production, shipments, and stocks on hand of finished Portland cement, by months—December, 1928, to May, 1930.

The Portland-cement industry in May, 1930, produced 17,271,000 bbl., shipped 17,210,000 bbl. from the mills, and had in stock at the end of the month 30,928,000 bbl., according to the United States Bureau of Mines, Department of Commerce. The production of Portland cement in May, 1930, showed an increase of 6.9 per cent and shipments an increase of 3.0 per cent, as compared with May, 1929. Portland cement stocks at the mills were 4.4 per cent higher than a year ago.

In the accompanying statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 166 plants at the close of May, 1930, and of 161 plants at the close of May, 1929. In addition to the capacity of the new plants which began operating during the twelve months ended May 31, 1930, the estimates include increased capacity due to extensions and improvements at old plants during the period.

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN APRIL, 1930

Exported to—	Barrels	Value
Canada	5,746	$22,516
Central America	3,599	9,343
Cuba	4,848	11,651
Other West Indies and Bermuda	3,505	7,848
Mexico	16,368	48,843
South America	19,413	76,101
Other Countries	3,940	23,915
	57,419	200,217

SHIPMENTS OF CEMENT, MARCH AND APRIL, 1929 AND 1930 (bbl.)

Shipped to	March		April	
	1929	1930	1929	1930
Alabama	127,916	104,750	166,925	126,501
Alaska	525	864	1,778	2,988
Arizona	57,406	44,917	51,150	45,312
Arkansas	93,133	86,481	99,392	130,247
California	1,063,895	720,008	973,052	824,463
Colorado	59,854	57,317	99,991	85,644
Connecticut	106,492	109,085	158,992	184,816
Delaware	19,112	19,467	31,219	32,573
District of Columbia	86,492	70,893	97,218	82,913
Florida	100,388	87,400	101,227	104,898
Georgia	95,061	101,858	139,353	139,155
Hawaii	22,366	22,829	24,308	26,240
Idaho	20,842	18,305	26,923	25,650
Illinois	612,069	379,453	1,069,018	694,367
Indiana	251,934	201,551	365,104	386,945
Iowa	123,637	117,907	215,629	447,570
Kansas	217,559	178,877	285,944	283,917
Kentucky	102,241	72,496	163,059	118,156
Louisiana	104,285	285,435	105,290	374,620
Maine	19,229	33,975	34,197	64,470
Maryland	131,729	172,822	169,575	257,033
Massachusetts	165,380	191,190	226,181	320,443
Michigan	474,902	344,412	785,443	599,371
Minnesota	136,193	91,055	220,077	248,088
Mississippi	75,353	56,606	76,425	42,812
Missouri	342,697	264,930	405,208	529,829
Montana	20,068	18,316	49,313	37,562
Nebraska	88,438	83,042	106,392	153,348
Nevada	9,755	11,923	10,848	15,637
New Hampshire	32,824	19,963	42,946	45,594
New Jersey	485,067	456,109	689,358	623,867
New Mexico	25,796	23,641	33,100	35,730
New York	1,285,742	1,095,878	1,598,671	1,556,095
North Carolina	159,570	101,751	224,791	141,565
North Dakota	16,912	20,791	62,207	39,253
Ohio	564,820	425,559	849,359	823,451
Oklahoma	318,321	283,365	309,739	381,939
Oregon	80,134	101,258	79,593	72,861
Pennsylvania	716,114	700,482	960,745	1,088,646
Porto Rico	420	2,125	975	1,300
Rhode Island	43,300	45,477	65,457	73,396
South Carolina	100,091	62,241	131,517	81,105
South Dakota	32,110	28,448	40,519	36,414
Tennessee	140,815	143,103	231,259	236,120
Texas	621,387	618,703	694,150	713,051
Utah	28,712	40,937	46,663	53,292
Vermont	24,984	23,132	33,872	32,457
Virginia	138,772	120,043	176,266	148,622
Washington	214,280	214,098	255,250	276,475
West Virginia	70,720	75,381	93,098	120,687
Wisconsin	197,738	159,096	352,986	299,210
Wyoming	7,672	9,934	12,491	15,870
Unspecified	28,531	40,274	20,771	14,500
	10,063,783	8,759,953	13,265,014	13,297,068
Foreign countries	49,217	66,047	59,986	42,932
Total shipped from cement plants	10,113,000	8,826,000	13,325,000	13,340,000

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN APIL, 1930

Imports from—	District into which imported	Barrels	Value
Belgium	Los Angeles	25	$ 41
	Massachusetts	62,901	79,612
	Philadelphia	29,418	40,463
	Porto Rico	3,106	4,131
	Total	95,450	124,247
Canada	Maine and New Hampshire	75	186
Denmark	Porto Rico	12,034	16,929
France	New York	985	2,144
Norway	Maryland	25	39
United Kingdom	New York	22,870	24,353
	Philadelphia	9,432	10,328
	Total	32,302	34,681
	Grand total	140,871	178,226

RELATION OF PRODUCTION TO CAPACITY

	May		April	March	February
	1929 (Per Cent)	1930 (Per Cent)	1930 (Per Cent)	1930 (Per Cent)	1930 (Per Cent)
The month	76.4	78.9	64.0	51.5	41.5
The 12 months ended	70.2	66.2	66.0	66.1	65.6

Month	PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1929 AND 1930 (*Thousands of bbl.*)						PRODUCTION AND STOCKS OF CLINKER, BY MONTHS, 1929 AND 1930 (*Thousands of bbl.*)			
	Production		Shipments		Stocks at End of Month		Production		Stock at End of Month	
	1929	1930	1929	1930	1929	1930	1929	1930	1929	1930
January	9,881	8,498	5,707	4,955	26,797	27,081	12,012	10,504	9,642	9,646
February	8,522	8,162	5,448	7,012	29,870	28,249	11,255	10,008	12,436	11,572
March	9,969	11,225	10,113	8,826	29,724	30,648	12,450	13,045	14,948	13,503
April	13,750	13,521	13,325	13,340	30,151	30,867	14,166	15,025	15,479	15,164
May	16,151	17,271	16,706	17,210	29,624	30,928	15,444	16,228	14,911	14,654
June	16,803	.....	18,949	.....	27,505	.....	15,312	.....	13,587	.....
July	17,315	.....	20,319	.....	24,525	.....	15,214	.....	11,619	.....
August	18,585	.....	23,052	.....	20,056	.....	15,829	.....	8,995	.....
September	17,223	.....	19,950	.....	17,325	.....	15,165	.....	7,009	.....
October	16,731	.....	18,695	.....	15,381	.....	15,515	.....	5,934	.....
November	14,053	.....	11,222	.....	18,213	.....	14,087	.....	6,134	.....
December	11,215	.....	5,951	.....	23,550	.....	12,539	.....	7,526	.....
Totals	170,198	.....	169,437	.....	.....	.....	.....	.....	.....	.....

District	PRODUCTION AND STOCKS OF CLINKER, BY DISTRICTS (*Thousands of bbl.*)				PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS (*Thousands of bbl.*)						
	Production		Stocks at End of Month		Production		Shipments		Stocks at End of Month		
	May, 1929	May, 1930	May, 1929	May, 1930	May, 1929	May, 1930	May, 1929	May, 1930	May, 1929	May, 1930	April, 1930
Eastern Pa., N. J. and Md	3,463	3,543	2,616	2,340	3,541	3,707	3,967	3,746	6,355	6,998	7,037
New York	1,089	1,067	1,382	986	1,137	1,176	1,184	1,191	2,195	1,847	1,862
Ohio, Western Pa. and W. Va	1,591	1,988	1,804	1,749	1,595	2,111	1,660	1,974	3,711	4,102	3,965
Michigan	1,229	1,204	1,376	1,847	1,387	1,419	1,322	1,229	2,724	2,785	2,595
Wis., Ill., Ind. and Ky	1,946	2,197	2,356	2,544	2,065	2,143	2,356	2,026	4,052	4,808	4,691
Va., Tenn., Ala., Ga., Fla. and La	1,143	1,403	1,232	1,074	1,276	1,306	1,301	1,192	2,117	1,865	1,751
Eastern Mo., Ia., Minn. and S. Dak	1,491	1,802	1,157	1,221	1,548	1,763	1,649	2,184	4,261	3,628	4,049
W. Mo., Neb., Kans., Okla. and Ark	1,094	1,272	751	446	1,117	1,360	1,007	1,390	1,527	1,807	1,837
Texas	617	596	187	379	655	630	563	620	535	836	825
Colo., Mont., Utah, Wyo. and Idaho	323	299	533	159	363	325	334	283	521	582	540
California	1,067	893	933	1,326	1,142	938	1,066	973	997	1,095	1,130
Ore. and Wash	391	364	584	583	325	393	297	402	629	575	585
Totals	15,444	16,628	14,911	14,654	16,151	17,271	16,706	17,210	29,624	30,928	30,867

Month	EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1929 AND 1930							
	Exports				Imports			
	1929		1930		1929		1930	
	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value
January	78,639	$283,002	82,387	$293,135	151,302	$177,976	201,609	$207,461
February	58,886	225,590	64,267	217,798	118,930	123,123	114,455	119,717
March	69,079	235,164	117,563	357,896	131,909	112,788	43,622	59,981
April	64,145	218,316	57,419	200,217	89,668	114,281	140,871	178,226
May	57,955	219,366	.....	.....	200,646	267,854	.....	.....
June	96,055	287,612	.....	.....	203,545	228,170	.....	.....
July	71,992	247,177	.....	.....	182,098	199,960	.....	.....
August	60,013	225,762	.....	.....	183,938	199,403	.....	.....
September	86,268	308,631	.....	.....	112,372	152,239	.....	.....
October	101,359	337,839	.....	.....	172,566	187,504	.....	.....
November	53,378	198,197	.....	.....	96,568	95,844	.....	.....
December	88,403	297,255	.....	.....	84,358	79,098	.....	.....
Totals	886,172	3,083,911	.....	.....	1,727,900	1,938,240	.....	.....

Lime Plant in Finland Is of Unusual Interest

Unusual interest is attached to the lime works of the Karl Forsstrom A. B. at Forby, Finland, both on account of the purity of the limestone deposits, which occur in a narrow band stretching across two islands off the southwest coast of Finland, and because of the mining method employed. Like other limestone deposits in Finland the stone is of archaic origin, varying from a coarse, crystalline structure to fine-grained marble, the latter sometimes analyzing up to 99.8 per cent calcium oxide. The deposit is about 700 meters long on Forby Island, and re-occurs on the neighboring island of Kimito. The width seldom exceeds 20 meters, and quarrying is complicated by this slight width between hard eruptive stones, and the dip of the deposit. Both open-face and underground methods have been used in the past. Within the last few years, however, the operators have developed a "magazine" method, in which a shaft is driven at 60 deg. (the pitch of the rock), and 110 meters deep. From the foot of the shaft two parallel galleries 10 to 12 meters apart are driven. The block between them is then excavated, and in the room thus formed the rock is excavated from the roof, working up progressively to form a huge magazine. The stone is then loaded into dump cars and hauled up the shaft to the surface. This method has the advantage of safe operation and also that the stone is stored in the mine until needed at the surface.

At the surface the stone is sorted by hand according to its purity. Some stone is sold in its natural state, the company having its own sail boats and steamers, and some is burned in a shaft kiln of oval section, built in 1896, and fired by two gas generators along each of the long sides. The fuel is wood refuse, and production averages 18 tons daily of a uniform snow-white, well-burned lime.

On Kimito Island are four open quarries worked by quite primitive methods. Some stone here also is burned in crude shaft kilns, but last year there was installed here a modern annular kiln with a 110-meter calcining tunnel, having 18 chambers of 55 tons of burned-lime capacity each. This is the largest annular kiln in Finland. The fuel is Polish and Upper Silesian coal and wood.—Ing. W. Moritz in *Tonindustrie - Zeitung* 54:335-7, March 10, 1930.

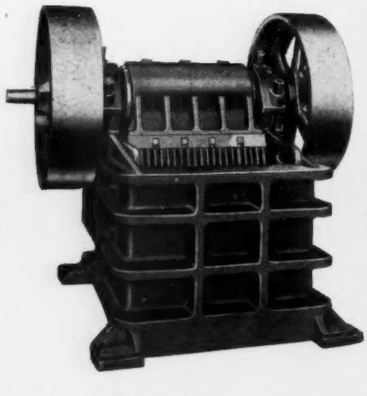
Does Your Crusher

run a full season without shut-down? No? Then you should know about *one* of the new construction details in the Wheeling Roller Bearing Crusher which absolutely guarantees long life and continuous crusher service.

A DUST GUARD THAT WORKS

Pictured above is a Dust Guard, which permits lubrication of the toggle joint, completely excluding all dirt, dust, grit, etc. Result is the greatly increased life of the toggle joint, which should allow a full season's run without shut-down. A dry toggle joint usually requires attention about every two weeks, and lubrication without dust and dirt protection is hopeless. The Wheeling Dust Guard has solved the problem of uninterrupted crusher operation, simply and effectively.

May We Tell You More?



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